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ANNALS OF SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE.

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THE CAUSE OF "STITCH ABSCESES" AND THEIR PREVENTION.

STERILIZATION OF THE SKIN PRIOR TO OPERATION BY
INUNCTIONS OF OLEATE OF MERCURY.

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THE condition of "stitch abscess" is probably one of the most familiar septic processes known in modern antiseptic surgery. There are few surgeons of any experience who are not occasionally troubled with these interruptions to rapid repair in a wound where every known precaution has been taken at the time of operation to guard against sepsis.

There are certain antiseptic precautions taken at every operation upon which the surgeon can place the utmost reliance inclusive of the sterility of his sutures and his ligatures; concerning these I have nothing further to say. But there are two, and I think two only, where doubt must always exist as to the certainty in which a perfectly aseptic result may be expected. These are (1) the condition of the surgeon's hands, and (2) the condition of the parts to be operated upon; or, in other words, the state of the skin and deeper tissues.

First let me allude to the operator's hands. It would be needless to refer to the innumerable experiments which have been performed with regard to the best way of rendering the skin of the hands aseptic. No known method has as yet produced infallible results. Doubtless some modes of preparation have stood the tests of delicate bacteriological experiments

better than others. But there is good reason, as will be presently shown, why none of these methods can be perfect in attaining the end desired. So long as an antiseptic solution forms a complete and constant coating to the hand, it is probable that infection from that source may be excluded. The greater the frequency with which the surgeon submerges his hands in some watery solution, either of carbolic acid or perchloride of mercury, during an operation, the more likely is it that his hands will remain throughout in a non-infecting condition. The danger of infection arises when, throughout a long and arduous operation, the operator does not take this precaution, although he may have previously cleansed his hands by the most approved antiseptic method. The reason for this danger is to be found in the following consideration. The skin of the hand while in use is being constantly lubricated by the secretions of the sudoriferous and sebaceous glands. The greater the general exertion required on the part of the surgeon, the more do the hands, in common with other parts of the body, respond to the call made upon them, and an abundant secretion takes place here as elsewhere. The dampness of the hands is a too familiar experience in hot weather or under other heated conditions, and during excessive exertion, to need more than mentioning: but its practical bearing in the case of a prolonged and arduous operation, undertaken perchance in a heated operating-room, requires more consideration.

It has been experimentally proved that the sudoriferous and sebaceous glands contain in their secreted products micro-organisms, which, while they may have found their way there through the blood, have more likely done so from the surface of the skin. Micro-organisms so located are in all probability neither removed by the *ordinary* washing of the hands, nor by the solutions used for strictly antiseptizing purposes. They make their appearance on the surface of the skin solely as the result of normal physiological processes. Hence, when through the arduousness of an operation these glands are thrown into excessive action, micro-organisms hitherto deep

seated are brought to the surface, and are ready there to infect the wound unless mechanically removed, or inhibited in their action by submergence of the hands in an antiseptic solution.

The method I now wish to describe, and which I have long practised, is founded on the physiological basis of exciting these glands of the skin to act freely before commencing the operation.

There are two ways by which secretion of the glands of the hand may be excited; one, *naturally*, by active general exercise coupled with enclosing the hands in rubber or kid gloves; and the other, *artificially*, by prolonged immersion of the hands in hot water. The only practical method is, of course, the latter. The hands are submerged for from five to ten minutes in water as hot as can be conveniently borne. The effect of this is to dilate all the capillary vessels, as indicated by the redness of the skin, and thus excite into active secretion the two sets of glands. The soddened surface epithelium together with the secretions are finally removed by first massaging the hands under water by making one rub the other, and then using some ordinary soap. Lastly, the hands are rinsed in warm carbolic lotion (1 to 40), which process is also continued throughout the operation.

It will thus be seen that much more importance is attached to the physiological side of the question than to the mechanical and the chemical. I am in the habit of tersely expressing my practice by saying to assistants that "soaking is better than soaping." It does away with the fallacious notion that any special kind of antiseptic soap is the chief agent in sterilizing the hands; or that it is merely the dipping of the hands into an antiseptic solution that is the principal requisite. The latter, of importance in themselves, are still only to be considered as necessary subordinates to the prolonged soaking and massaging in hot water.

Let me now turn to the second of the two pre-operative precautions upon which a surgeon is unable at present to place the most implicit trust,—the antisepticizing of the skin and deeper tissues. It is upon the possibility of removing to some

extent doubts and fears in this direction that I have been tempted to put on record certain practises which I have successfully carried out for some time.

It was very clearly and convincingly demonstrated by Mr. C. B. Lockwood some ten years ago, when working under the Scientific Grants Committee of the British Medical Association, that, prepare the skin as carefully as we might, it could always be shown to contain micro-organisms.

I cannot do better than give the following quotation from Mr. Lockwood's report upon his investigations. The reference is to a case of removal of a chronic mammary tumor.

"Although in it the skin had been washed and scrubbed until the woman complained, had been washed in 5 per cent. carbolic solution, covered for eighteen hours with an antiseptic dressing, and finally washed just before the operation with perchloride of mercury solution 1 in 1000, nevertheless, a bit of this skin infected culture tubes with cocci, streptococci, diplococci, and bacilli such as are usually found in the skin. The reason for this failure to disinfect the skin was shown in the following way:

"A cover-glass preparation of the contents of a sebaceous gland stained with fuchsin shows that sebum is a mass of cocci, diplococci, and bacilli together with occasional epithelial cells. After an area which has numerous sebaceous glands had been washed with soap and water, then with perchloride of mercury lotion 1 in 1000, and, lastly, with absolute alcohol, its glands were squeezed and cultures inoculated from its surface. The result was a plentiful growth of long and short bacilli, leptothrix, monococci, diplococci, and staphylococci. In a similar way the properties of the sweat glands were shown. A perspiring surface was washed with soap and water, then with perchloride of mercury lotion 1 in 1000, and afterwards with absolute alcohol. As soon as the sweat reappeared, nutrient material was inoculated with it and grew quantities of staphylococci, and in old cultures some bacilli and leptothrix. Thus there was a slight difference in the first result of these experiments. Sweat glands gave a growth of cocci with few bacilli, whilst sebaceous glands gave bacilli with few cocci.

"These simple observations and experiments point to an

obvious cause for the infection of antiseptic wounds, and render the microbes of the skin of great importance." (*British Medical Journal*, 1892, Vol. i, page 1127.)

This teaching of the naturally septic conditions of the skin, and the practically septic state of every wound made by the surgeon, has now come to be pretty widely, though far from generally, recognized. It was the theme of an excellent paper read by Professor Bloch, of Copenhagen, at the International Medical Congress held in Paris last year (1900); and it has gone far to establish the principle of antisepsis as opposed to that of asepsis in the performance of all operations and in the treatment of all wounds.

We have then before us these established facts: that the skin with its secreting glands and lymphatics contains micro-organisms; that these micro-organisms cannot be got at by the ordinary methods in use of watery antiseptic solutions; and that these same organisms are liberated and find a nidus for development in the various wounds made by the surgeon in the operative treatment of disease. Before proceeding to describe the means I propose should be adopted in order to check, or at least to lessen, the possibilities of infection, let me briefly indicate how I believe infection and its inflammatory consequences are brought about.

The two places at which it is possible for micro-organisms to be liberated, and when set free develop or multiply, are the edges of the wound, both superficial and deep, and the channels made by the stitches. In the first instance, with regard to the wound edges, the line of lesion may pass through micro-organism-bearing centres, in which case a free exit is formed on to the exposed surfaces of the wound. If, then, want of accurate coaptation of the wound edges or surfaces should allow of the collection of fluids, a suitable nidus and culture medium is at once established for the unhindered development of such micro-organisms as find their resting-place there. It is only the direct contact of living cells that can combat the active growth of these intruders. Cells and fluids that become vitally

inactive or dead have no longer any resisting properties, but, on the other hand, become the very means of accelerating and encouraging growth and the septic processes directly dependent thereon. It follows, therefore, that if infection and its consequences are to be successfully combated in regard to the wound surfaces, without the introduction of any other aids or preventives, it must be, first, by the accurate coaptation of the wound edges; and, second, where that is not possible, by the removal, by drainage, of all inert vitalless fluids from between the surfaces.

With regard to the second seat of infection, the stitch channels, it is probable that this forms the most frequent and fruitful source of subsequent septic troubles in most wounds. The so-called "stitch abscess" is probably thus explained. The needle as it passes through the tissues may perforate and expose a micro-organism-bearing focus. If silk is the material used for suture, cells and fluids percolate its fibres, and, thus removed from all vital influences, these media serve as a nidus and as nourishment for the growth and development of such micro-organisms as gain entrance into the thread. But probably no deleterious effect would follow, were it not that a much more fertile and extensive soil is created by the necrosis of tissues in the immediate neighborhood of the tightened stitch. It is a perfectly familiar experience to observe how, as a suture is tightly tied, the skin in its immediate neighborhood is whitened; that is to say, the pressure produced by the tightening stitch drives out all the blood from the capillary vessels. The result of such total depletion is to cause death of the tissues so deprived. Hence, such micro-organisms, as have been set free by the needle puncture, and perchance taken up their location in the meshes of a silk thread, find in this devitalized tissue the very medium they require to multiply abundantly, and thus rapidly exceed in their offensive properties all protective barriers set up by the surrounding healthy tissues. Every degree of this process may be observed in a wound, from the faintest pink blush around the point of exit of the suture to the formation of a distinct localized abscess.

And, further, many a deeper-seated abscess, one rather beneath the skin edges than actually in the skin proper itself, owes its origin to a precisely similar cause.

Such, then, are the ever present sources of infection in a wound, and the question is, Can they be dealt with in such a way as to no longer be factors of moment in the rapid and uncomplicated healing of a wound? I think they can; and it was to this end that now nearly a year ago I put into practice a system of treating the skin, which, while it has not in an experimental or laboratory sense quite fulfilled my expectation, has done so from the clinical stand-point.

The principle is very briefly enunciated. The fact that it is possible to salivate a patient by the inunction of the skin of the abdomen with a mercurial ointment proves that the agent applied is carried by natural channels so as to produce an effect upon a comparatively distant region elsewhere. The means of transit is almost certainly by the lymphatics, and so long as the agent is kept in contact with the skin, so long will these channels be engaged in transmitting it to other parts.

From these facts it seemed reasonable to infer that when an operation was performed upon parts whose lymphatics contained such a potent bactericidal agent as mercury, this should not only prove destructive to any micro-organisms with which it might come into direct contact, but its presence should still further render the normal tissue in a state unfit for the multiplication and development of these bodies.

There were three tests to which this theory might be put.

The first, to determine chemically the actual presence of mercury in the tissues beneath the skin.

The second, to submit fragments of skin to bacteriological investigation; and

The third, to try the process clinically.

In furtherance of these objects, the following line of action was taken.

The skin at and around the part to be operated upon was first cleansed with soap and water, and, if considered necessary, further treated with turpentine and spirit, thoroughly

dried, and then freely anointed with hydrated lanoline containing 20 per cent. of oleate of mercury. For from five to ten minutes this preparation was well rubbed in, and then the part covered with a piece of lint besmeared with the ointment. This lint was removed at the end of twenty-four hours, and a second inunction carried out, with the reapplication of a freshly besmeared piece of lint. This second piece remained on the part for a second twenty-four hours, that is, until the part was exposed for the performance of the operation.

Held in readiness for the operation were two plugged sterilized test-tubes, one containing a small quantity of rectified spirit, the other sterile bouillon. The operator, after drying his hands and his knife and forceps with a piece of sterilized gauze, removed also with a piece of the same sterilized agent the lanoline-mercury preparation from the anointed skin.

The first incision was made, and from the edges were removed two fragments of tissue,—a piece of skin which was inserted into the sterile bouillon tube, and a piece of subcutaneous or deeper tissue into the tube containing the spirit.

These two tissue-containing tubes were then sent, the one with the piece of subcutaneous tissue to Mr. Gilmour, the Infirmary apothecary, to be tested for the presence of mercury; the other, with the piece of skin, to Dr. Anderson, the Infirmary pathologist, to be tested for micro-organisms.

It should be noted that in the earlier stages of the investigation we sometimes carried our period of preparation of the skin to three and four days, and in one to seven days. This was latterly given up, for the good reason that the skin frequently began to show signs of irritation, amounting in more than one instance to considerable superficial inflammation with innumerable minute pseudo-purulent looking vesicles. That this condition was purely chemical in its source, and in no way connected with the micro-organisms, was proved by three tests; one, the microscope showed the contents of the vesicles to contain only epithelial cells; culture experiments of the same gave absolutely negative results; and the parts operated upon when in this state healed by primary union. However, while the

extra period of preparation would be useful for purely laboratory purposes, the requirement of three or more days would prove clinically impracticable, and the possibility of skin irritation a source of physical discomfort to the patient. Hence, if the method was to be one of any practical value, it must prove itself to be so after a two days' preparation of the skin with the ointment.

It may be stated here that in no case were any general or constitutional effects observed. They were carefully watched for, especially where large surfaces, such as the abdomen, were under treatment. And as regards the general clinical observation of the cases, including all points connected with preparation of the patient, the condition of the parts previous to preparation, the nature of the operation performed, and the after effects, careful notes were kept by the Sister in charge of each case.

I now propose to give the results as derived from these three sources,—chemical, bacteriological, and clinical. Mr. Gilmour has been good enough to give me the following report of his investigations upon the endeavor to detect the presence of mercury in the fragments of subcutaneous tissue submitted to him.

“The analytical method employed was applied with every precaution against error, and sometimes repeated for particular specimens with the additional check of control experiments. The method was that found so successful in toxicological work. The results in every case were unequivocally negative.”

The report then proceeds to describe in detail the method employed; but the negative results obtained render it unnecessary to introduce this part. Mr. Gilmour's remarks, however, at the conclusion of his report are worthy of consideration, as probably explaining the true cause of the apparent absence of mercury in the fragments of tissue examined:

“There are several considerations which serve to modify the apparently negative issue of the above analyses. In the first place,

the presence of minute traces of mercury is not so readily detected as, say, arsenic, antimony, etc., and secondly, even assuming all the oleate to have been absorbed, it is not probable that the actual quantity of mercury contained by the tissue at the time of its removal would be chemically appreciable, especially as the average weight of the shreds of tissue examined was not more than .5 gramme, that is, $7\frac{3}{4}$ grains. The preparation used to anoint the skin contained only 20 per cent. of mercuric oleate; and of the oleate only five-ninths is mercuric mercury. In other words, out of every 100 grains of oleate, there are no more than eleven grains of available mercury. Any unit of area, such as a square centimetre, would receive a mere fraction of 100 grains, and it is impossible for one to surmise what fraction of this fraction might be present in a fragment of absorbent vessels and the circumjacent tissue."

I now give the report of Dr. Anderson upon the bacteriological examination of the fragments of skin submitted to him for investigation.

"The method of work was as follows: Two pieces of skin were submitted from the first six cases; one portion was kept in the nutrient broth and incubated for twenty-four or forty-eight hours, and failing growth kept in the incubator for a week or longer. If the broth was found sterile at the end of this time, the case was regarded as sterile. When growth on bouillon was obtained, subcultures on solid media were prepared and studied. From the second piece of tissue plate cultivations of agar and gelatine were prepared and examined. In the last eight experiments one piece of skin was submitted for examination, and after twenty-four hours in incubator in the nutrient broth, examined and subcultures prepared on solid media.

"Positive results were more frequently obtained from the fluid media than by plate cultivation; and in the case of the former the growth after twenty-four hours was but slight in many of the cases, forty-eight hours and occasionally longer being required to show distinct evidence of the presence of organisms, while the number of colonies present in the plate cultivations were few. In two cases only were mixed cultures obtained and the organisms had to be separated; in the others pure cultures were obtained.

"The organisms mentioned as *staphylococcus albus* may be either the *staphylococcus pyogenes albus* or the *staphylococcus epidermidis albus*, but no inoculation experiments were undertaken to decide this question or to test the degree of virulence of the organisms present.

"The table shows the results obtained.

"Of the fourteen cases four were found to be absolutely sterile, while in two cases where two pieces of tissue were examined sterile results were obtained from one piece in each case, while the other portion showed the presence of micro-organisms, viz., the *staphylococcus albus* and *bacillus subtilis* respectively. In other cases the organisms found were the *staphylococcus albus*, *diplococcus epidermidis albus*, *staphylococcus pyogenes citreus*, and *sarcina lutea*.

"The results obtained would indicate in those cases where organisms were present that the growths were retarded by the presence of traces of the preparation reagent in the skin, or that the cultivations were obtained from but a few actual organisms."

It may be incidentally mentioned here that Dr. Anderson carried out a series of experiments to test the bactericidal properties of the preparation in use for anointing the skin. As the mercury exists in chemical combination with oleic acid, it occurred to me as possible that the usually antiseptic potency of mercury in its combination with hydrochloric acid in watery solutions might not exist to a similar extent when the mineral was in chemical union with an organic acid—that in fact we might be using an absolutely sterile medium, but not one which possessed any active bactericidal properties. Dr. Anderson, however, was able to prove that the lanoline-oleate preparation possessed distinctly these properties when subjected to the severe test of treatment with pure cultures. The actual details in connection with the investigation need hardly be given, as the mere positive fact in regard to it is all that is required.

Returning now to Dr. Anderson's report, it may be said that in order to have obtained proper proof as to the value of the method in sterilizing the skin, control experiments should have been conducted with similar fragments of skin where the ordinary processes of antiseptic preparation had been adopted.

but with the additional injunction excluded. It seemed, however, needless to do this in face of the experiments already carried out by Lockwood and others, where there was unmistakable proof of the great abundance of micro-organisms in the skin of parts prepared by the customary antiseptic methods. The only reason, perhaps, in favor of such control experiments being executed is the better comparison of results afforded when executed by the same investigator. Dr. Anderson's methods were, however, sufficiently careful, I think, to ensure the detection of any micro-organisms present in the fragments of skin submitted to him. This being accepted, it is impossible not to conclude that, considering the various parts of the body from which fragments of skin were removed, there was in none such a development of micro-organisms when submitted to culture experiments as existed in the case of skin unprepared by the lanoline-oleate of mercury method, although subjected to the usual rigid antiseptic modes of preparation.

I come, lastly, to the results obtained from the clinical aspect of the question.

An analysis of the first fifty cases, in which the skin was prepared for periods mostly of forty-eight hours, showed that in two some slight redness was noticed along the skin edges, and in four there were variable degrees of septic inflammation. In these four cases it is interesting to note that three of them were cases of tubercular cervical glands, and one where a septic sinus previously existed.

Inasmuch as good results were obtained by a twenty-four hours' application of the ointment as by longer periods, prolonged use of the drug may not be necessary. However, if not actually necessary, I think it is expedient.

Reviewing the general results obtained from these three series of investigations, it seems that the following conclusions may be arrived at:

(1) The chemical examination failed to afford any positive information. Either the mercury was in too small quantity to be detected, or its absorption and transit through the lymphatics too rapid to be caught for analysis.

(2) The bacteriological examination proved a material diminution in the number of micro-organisms present. That any should be present at all is probably to be explained by the fact that the ointment cannot reach all the seats where they exist. Thus, micro-organisms located in the hair follicles, or in the ducts of the sebaceous or sudoriferous glands, cannot be reached by the process of inunction; and therefore, when fragments of skin containing them are embedded in nutrient media, they soon discover a soil upon which they can develop.

(3) The clinical records seem to afford incontestable proof of the value of the method. That microbes were in all probability present in the tissues operated upon, and yet failed to develop into a pathological process, is, I believe, thus explained. The sterilizing effect of the inunction is productive of two results,—it kills every organism in the lymphatic channels, and so influences the living tissues that they can successfully inhibit the further development of those which remain.

In conclusion, let me briefly indicate the method by which the skin should be prepared for operation with the lanoline-oleate of mercury ointment.

(1) Cleanse the skin in the usual way by soap and water (turpentine and alcohol, or ether, if necessary).

(2) Anoint freely and widely with hydrated lanoline-oleate of mercury (20 per cent.) and rub in; besmear a piece of lint with the same and leave on until a second inunction is performed twelve hours later. Every case should be treated for at least twenty-four hours before operation; preferably forty-eight hours should be given, with at least two separate periods of "rubbing in" for about ten minutes on each occasion.

(3) On the operating table the piece of lint is removed, and the superfluous ointment rubbed off with a piece of sterilized gauze. The part is now ready for operation.

I must return my very warm thanks to Dr. Anderson, the pathologist of the Infirmary, and to Mr. Gilmour, the apothecary, for the investigations which they so kindly executed for me.

TABLE SHOWING BACTERIOLOGICAL EXAMINATION OF SKIN AFTER TREATMENT WITH LANOLINE-OLEATE OF MERCURY.

No. of Experiment.	Nature of Case.	Time of Preparation.	Condition of Skin prior to Incision.	Bouillon Cultures.	Sub-cultures from Bouillon.	Agar Plate Cultivations.	Gelatine Plate Cultivations.	Result.
I.	Nephrectomy.	Two days.	Unbroken.	a) Negative. β) Staphylococcus albus, faint growth after twenty-four hours, more marked after forty-eight hours	a) Negative. β) Staphylococcus albus from forty-eight hours' culture.	a) Negative. β) Negative.	a) Negative. β) Negative.	a) Sterile. β) Staphylococcus albus.
II.	Radical cure of hernia.	One day.	Unbroken.	a) Negative.	a) Negative.	Negative.	Negative.	a) Sterile.
III. IV.	Appendicectomy. Radical cure of hernia.	Two days. Two days.	Unbroken. Unbroken.	β) Bacillus subtilis. Negative. a) Staphylococcus albus. β) Staphylococcus albus.	β) Bacillus subtilis. Negative. a) Staphylococcus albus. β) Staphylococcus albus.	Negative. Negative. Staphylococcus albus three colonies, pyogenes citreus one colony.	Negative. Negative. Staphylococcus albus.	β) Bacillus subtilis. Sterile. a) Staphylococcus albus. β) Staphylococcus albus and staphylococcus pyogenes citreus.
V.	Cervical glands.	Four days.	Unbroken.	α and β) Staphylococcus albus and diplococcus epidermidis albus.	Same organism.	Same organism.	Staphylococcus albus.	Staphylococcus albus and diplococcus epidermidis albus.
VI.	Laparotomy.	Two days.	Unbroken.	Staphylococcus pyogenes citreus.	Same organism.	Same organism.	Same organism.	Staphylococcus pyogenes citreus.
VII. VIII. IX. X.	Excision of ankle. Varicose veins. Appendicectomy. Gastrojejunostomy.	Seven days. Four days. Three days. Two and one-half days.	Unbroken. Unbroken. Unbroken. Unbroken.	Negative. Negative. Sarcina lutea. Negative.	Negative. Negative. Sarcina lutea. Negative.	Negative. Negative.	Negative. Negative.	Sterile. Sterile. Sarcina lutea. Sterile.
XI.	Nephrectomy.	Two and one-half days.	Unbroken.	Staphylococcus albus.	Staphylococcus albus.	Staphylococcus albus.	Staphylococcus albus.	Staphylococcus albus.
XII.	Nephrorrhaphy.	Two and one-half days.	Unbroken.	Staphylococcus albus.	Same.	Staphylococcus albus.	Staphylococcus albus.	Staphylococcus albus.
XIII.	Erasion of knee.	Three days.	Unbroken.	a) Staphylococcus albus and diplococcus epidermidis albus. β) Staphylococcus pyogenes citreus.	Same. Same.	Staphylococcus albus and diplococcus epidermidis albus. Staphylococcus pyogenes citreus.	Staphylococcus albus.	a) Staphylococcus albus and diplococcus epidermidis albus. β) Staphylococcus pyogenes citreus.
XIV.	Nephrorrhaphy.	Three and one-half days.	Unbroken.	Staphylococcus albus.	Staphylococcus albus.	Staphylococcus albus.	Staphylococcus albus.	Staphylococcus albus.

REPORT OF SIX CASES OF PENETRATING
WOUNDS OF THE ABDOMEN SUBMITTED
TO ABDOMINAL SECTION,

WITH STATISTICAL TABLES OF ONE HUNDRED AND FIFTY-TWO
CASES THUS OPERATED ON AT THE CHARITY HOSPITAL IN
NEW ORLEANS, LA.

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FIRST ASSISTANT SURGEON TO THE CHARITY HOSPITAL; LECTURER ON THE
DISEASES OF CHILDREN IN TULANE UNIVERSITY.

It is the purpose of the present paper to record six cases of laparotomy for penetrating abdominal wounds, in which the operation was performed by myself, and to furnish the completed statistics of the New Orleans Charity Hospital from January, 1892, when operative intervention was first attempted, to January, 1901. Although two of these cases here reported were unattended by any visceral injury, they are given with the others because of the near sequence in time, and because the histories were at hand. I have myself operated upon many other cases, some of them successfully, but, owing to imperfect records, I have not the necessary data to report them.

Despite the high mortality, I think the indication for operation is pretty generally accepted now the world over. At the Charity Hospital we operate as soon as possible on all cases where penetration of the cavity has occurred, *except* where, in the upper thoracic belt, it appears that, on the left side, the viscera have escaped injury, and, upon the right, that only the liver has been injured. These cases we generally leave alone, unless there is evidence of severe internal hæmorrhage, when, under suitable conditions, an attempt would be

made to get at the bleeding point to secure hæmostasis by suture or packing.

The decision to operate is also influenced by the length of time which has elapsed since the wound was inflicted. After twenty-four hours operative interference is useless, and even after twelve hours the prospect of recovery is so small as to make the operation a doubtful procedure. Even under the best conditions, in gunshot wounds, done with the ordinary large calibre bullet, with injury of the intestines, the prognosis is so grave and the result so uncertain that we must approach these cases always with a certain amount of despondency. In spite of the most careful technique, and even after extensive experience, it can never be told, from the conditions found at operation, whether the patient will go on to recovery, will exhibit a rapidly fatal peritonitis, or develop a more gradual but equally mortal form of peritoneal inflammation. It seems clear, however, that an empty stomach and intestines undistended by gas are conditions favorable to recovery.

The deplorable termination of the case of President McKinley, which plunged the whole country into sorrow, has awakened new interest in the subject of gunshot wounds of the abdomen. The absence of vomiting, and the cheerfulness of the distinguished patient, had aroused the most sanguine hopes for his recovery. And yet the condition of the wounded organs, at the autopsy, showed that a fatal termination had been from the beginning inevitable. In our numerous post-mortems at the Charity Hospital upon such cases, we have not infrequently found a somewhat similar condition of affairs,—little or no peritonitis, but gangrenous areas about the lesions in the bowels, apparently due to the contusing effects of the bullet upon tissues possessing too little vitality to recover from the shock. These cases had survived several days, often with little distention or vomiting, but with some temperature and always with an anxious expression and a *rapid pulse*, that great danger-signal in all cases of abdominal wounds.

Let me now briefly relate the histories of the cases I have to present.

CASE I.—*Stab Wound of Abdomen; Omentum protruding; Excision of Omentum; Laparotomy; Recovery.*—C. B., negro man, aged twenty-one years, was brought in on the ambulance on February 8, 1900. He had received a stab wound of the abdomen, through which a piece of omentum was protruding. He was immediately prepared for operation, and, under chloroform, the protruding omentum was ligated and cut off. The wound was enlarged to permit inspection of the cavity. A large amount of blood was found in the upper part of the abdomen, and the incision was still further enlarged to permit freer examination. No lesion of the viscera, however, was discovered, and, after thoroughly flushing the belly, the incision was closed with through-and-through sutures of silver wire. Man was sent to bed in good condition. At the end of thirty-six hours the bowels were moved well, and, after an uneventful convalescence, he was discharged on March 7, 1901.

CASE II.—*Gunshot Wound of Left Lumbar Region, penetrating Abdomen; Three Perforations of Colon, and a Graze Wound of Stomach; Laparotomy; Enterorrhaphy; Recovery.*—J. L., colored, male, aged sixteen years, was brought into the hospital on the ambulance about 3.30 P.M. on February 27, 1900, with a gunshot wound of the left lumbar region; there was no wound of exit. The boy had eaten a hearty meal and drunk a great quantity of claret, and there was much vomiting and some shock. Nothing characteristic about vomited matter. Tenderness and pain referred to the region of the wound. As soon as the abdomen could be prepared, cœliotomy was done about three hours after injury.

Operation, under chloroform; incision about eight inches long, in median line. A considerable quantity of blood was found in the cavity, with some particles of matter from the bowels. The bullet had perforated the descending colon twice, very near the splenic flexure, and inflicted a third wound, which cut through the serous and muscular coats, but did not penetrate the mucous membrane. The bowel was comparatively empty, and there had not been much escape of fecal matter. One of the perforations involved the mesenteric attachment, and some difficulty was had in properly securing it. The location of the wounds made them somewhat inaccessible, and necessitated the large abdominal incision.

The stomach, in spite of free vomiting, was half full, and presented at the cardiac end a wound of the serous and muscular coats, but with the mucous membrane intact. This, like the wounds in the intestine, was closed with Lembert sutures of fine silk.

The bullet had evidently ranged upward and forward, but we were unable to discover where it had gone after striking the stomach.

The abdominal cavity was thoroughly flushed with hot normal salt solution, a good deal of which was left in the cavity, and was then closed with through-and-through sutures of silkworm gut. The bullet wound in the back was sealed with cotton and collodion. Operation from beginning of anæsthesia to completion of dressing occupied an hour and a half. Patient went to ward in good condition.

Clinical Notes.—First day. No vomiting followed operation. No pain was complained of on recovery from anæsthesia. The patient was very tractable, lying perfectly quiet and sleeping most of the time. His nervous system did not appear to be highly organized and sensitive, which no doubt was a favorable condition.

Water in tablespoonful doses and cracked ice were allowed during the night. Hypodermic stimulation of *Tr. digitalis*, three minims, strychnine sulphate, one-ninetieth grain every four hours. Ice-bag to abdomen.

Second and third days. Moderate tympanites developed, causing patient to complain that bandage was too tight; this subsided slowly during the next two or three days. Vomited once during night of third day.

Fourth day. Up to this time nothing but the water and cracked ice had been given. Milk-punch, Ducro's elixir and beef-tea in half-ounce doses, alternating every two hours, were now allowed. Vomited once.

Fifth day. Strained orange juice and chicken soup added to diet.

Sixth day. No movement of bowels up to this time. Sodium phosphate, one and one-half drachms in solution, every two hours, for five doses, produced two copious movements. No pain resulted. Abdominal dressing changed.

Seventh day. Sodium phosphate, one and one-half drachms, three times a day. One large movement.

Eighth day. Hypodermic stimulation discontinued. Wound dressed. Several stitch abscesses found. Bowels moved. *A considerable quantity of arterial blood passed.* No pain or bad symptoms resulted. Morphine sulph. one-eighth grain, Fl. extract ergot one-half drachm by needle. Ice-bag to abdomen. Food stopped.

Ninth and tenth days. No food. Nothing special to note.

Eleventh day. Another movement of bowels, with a second hæmorrhage. Ice-bag. Morphine and ergot given.

Twelfth day. Stitches removed. Small abscess around them.

Thirteenth day. Feeding resumed. From this time recovery was uninterrupted. Bowels moved every second day. Diet was gradually increased in quantity and variety. Stitch abscesses were dressed frequently, and by twentieth day abdominal wound was entirely well.

Twenty-sixth day. Patient up out of bed.

Thirty-second day. Discharged cured.

Special Features.—No food till fourth day. Hæmorrhage from intestines on eighth and eleventh days.

For the excellent record of this case, I am indebted to Dr. Carroll W. Allen, at that time the interne of the service.

CASE III.—*Gunshot Wound of Right Buttock, penetrating Abdomen; One Perforation of Bowel, one of Bladder; Laparotomy; Enterorrhaphy; Suture of Bladder; Recovery.*—C. H., negro man, aged twenty-seven years; well nourished and muscular; has had syphilis and several attacks of malaria. A free drinker. On Christmas day, 1900, at about 6 P.M., while standing at a grocery bar, he was fired on by an old enemy, the ball entering the left side near the tenth rib, and coursing along the bone to lodge beneath the skin near the left costal arch, causing only a superficial wound. The patient turned to escape, when a second shot struck him in the right buttock. After being wounded the second time, he walked two squares to his home, when the ambulance was summoned and conveyed him to the hospital.

On examination, I found the second ball just beneath the skin above the pubes, and urine drawn with the catheter contained blood. He was immediately prepared for operation, and under chloroform an incision was made over the bullet, which was extracted. The cut was extended to open the cavity and permit examination of the bowels and bladder. Very little blood or urine

was present in the belly, but in going over the intestines I found a perforation of the ileum, which was closed with Lembert sutures of fine silk. The bladder wound was now searched for. It proved that the ball had struck the very summit of a partially distended bladder, making only one hole in the viscus. This was closed by a double row of Lembert sutures. The cavity was well washed out and the peritoneum carefully sutured. The incision in the skin and muscles was now closed with silkworm gut, except a small portion at the lower end, into which was inserted a wick of iodoform gauze. Patient returned to ward in good condition. Hypodermic stimulation ordered, and the catheter to be used every two hours. After twenty-four hours, catheterization only every four hours. On the morning of third day he had a hard chill, followed by fever, and later in the day another chill. These were plainly urethral, from irritation by the catheter, and its use was discontinued. He had no difficulty in voiding the urine voluntarily. On third day bowels were moved by an enema, and thereafter every second day, unless evacuation occurred unaided. The stitches were removed on twelfth day. He never exhibited any symptoms of peritonitis, and was permitted to sit up in bed on fourteenth day. On January 14, 1901, he was discharged perfectly well.

CASE IV.—*Gunshot Wound of Left Hip; Eight Perforations of Intestine; Laparotomy; Enterorrhaphy; Recovery.*—J. P., negro man, aged twenty-seven years, was shot about 10.30 P.M. on May 11, 1901, and sent to the hospital in the ambulance. Examination showed that the ball had entered the left hip about one and a half inches above and half an inch in front of the trochanter major. Vomiting, and extreme pain and tenderness over the abdomen, indicated that the bullet had passed through the ilium and entered the abdominal cavity. He was at once prepared for operation, and under chloroform the belly was opened in the median line, below the navel. Much blood welled up through the incision, and when the bowels were gone over, eight perforations of the ileum were found and sutured. In this case, owing to the number of the wounds, I tried the continuous Cushing suture, using fine silk; and when the apposition was not perfectly satisfactory, running back over the first line a second row of sutures. Some of the holes I closed with the usual Lembert stitch. I must say I was pleased with the Cushing suture. (In

the next case in which I used it, however, my patient died, so that it cannot be considered as having any special life-saving properties of its own.) After repairing all the wounds in the bowel, the abdomen was thoroughly washed out with salt solution, and the incision closed with silkworm gut. Patient went to ward in good condition.

Second day. Somewhat restless, but not nauseated. Hypodermic stimulation. Ice-bag to belly. Cracked ice by mouth. In the evening, Ducro's elixir in teaspoonful doses tried, but soon discontinued because of slight nausea.

Third day. Ducro, milk-punch, beef-tea in two drachms doses.

Fourth day. Nourishment increased to one-half ounce at a time. Hypodermic stimulation stopped, and strychnine, one-thirtieth of a grain, by mouth given every four hours.

Sixth day. Patient has been doing so well that nourishment has been increased to two and one-half ounces every two or three hours. Temperature has not been above 99.6° F., but this evening went to 102° F., and he complains of pain in left side of belly. Salol, five grains, every four hours.

Seventh day. Temperature normal.

Eleventh day. Patient is now on full liquid diet. The bowels have not moved since he was shot, but he has frequently passed large quantities of gas. Sodium phosphate, one drachm, in milk every four hours.

Thirteenth day. Phosphate has not yet moved the bowels. Eight ounces of olive oil given by enema.

Fourteenth day. Enema of soapsuds (hot), containing Epsom salts, one ounce, has at last produced a copious action. Another enema the next day had an equally good effect. From now on the bowels moved regularly every day.

Seventeenth day. Stitches removed.

Eighteenth day. Discharged perfectly well.

CASE V.—*Incised Wound of Abdomen; Escape of Intestines; Laparotomy; Recovery.*—P. R., white child, aged four years, admitted on ambulance, May 4, 1901. This little fellow was walking down the steps carrying a glass, when he slipped, dropping the glass, which was shattered. He fell forward upon the broken pieces, one of which inflicted a wound in the rectus muscle, penetrating the abdomen, through which about a foot and a half of in-

testine escaped. Fortunately he was not interfered with till the ambulance arrived, when the surgeon in charge wrapped the bowel in sterile gauze, and rapidly transported the child to the hospital. Under chloroform the abdomen was cleansed, the protruding intestines washed with hot saline solution and replaced in the cavity. The wound was now enlarged, and it was positively determined by examination that the bowels were intact. The abdomen was flushed and the wound closed with catgut in tiers. The child was not in the least shocked when he reached the hospital, and he stood the operation splendidly. Convalescence was so uneventful as to require no comment.

CASE VI.—*Gunshot Wound of Thorax, penetrating Abdomen; Wound of Diaphragm, Spleen, Stomach, Liver; Splenectomy; Suture of Diaphragm, Stomach, and Liver; Recovery.*—A. L., negro man, aged twenty-seven years, was brought in on the ambulance on September 8, 1901, with a gunshot wound of left thorax, about the level of tenth rib in the axillary line. Abdominal pain and tenderness, with vomiting of blood just after he was shot, made it plain that operation was demanded. He was immediately prepared, and under chloroform the belly opened in the median line from the tip of the sternum to below the navel. A large quantity of blood was found in the upper abdomen. When this was sponged away and the intestines gotten out of the field by gauze sponges, the spleen was seen to be bleeding from a large hole blown through it by the bullet. The spleen was removed as quickly as possible,—no easy task with a normal organ,—and meanwhile the bleeding was partly controlled by pressure with the fingers. When the spleen was gotten out of the way, a large hole in the diaphragm could be seen, through which the air was rushing in and out with a loud noise every time the man breathed. The lung was, of course, collapsed, but the patient took the anæsthetic very well. The hole in the muscle was closed by two silk sutures, and our attention was now turned to the stomach. A good sized hole was found in the cardiac extremity, but, fortunately, though the muscular and serous coats were badly hurt, only a very small opening had been made in the mucous membrane, through which none of the stomach contents had escaped. This wound was closed with Lembert sutures. A laceration of the under surface of the left lobe of the liver was secured by two silk sutures. The ball, after hitting the liver, had dropped back, and

was found in the folds of the gastrocolic omentum. All blood was now gotten rid of by flushing, and the abdominal wound closed with silkworm gut.

During the operation the patient was badly shocked, and I was obliged to change from chloroform to ether, give hypodermics of brandy, digitalis, strychnine, and atropine, and infuse two pints of saline solution into the vein at the elbow. He went to the ward depressed, but next morning had entirely recovered from the shock.

Second Day.—6 A.M., Temperature, 98.5° F.; pulse, 98; respiration, 40; vomiting. 9 A.M., Temperature, 99.1° F.; pulse, 80; respiration, 48; vomiting. 12 M., Temperature, 99.1° F.; pulse, 88; respiration, 48; vomiting. 3 P.M., Temperature, 99.1° F.; pulse, 86; respiration, 40; vomiting. 9 P.M., Temperature, 99.1° F.; pulse, 82; respiration, 42; vomiting ceased.

Third Day.—6 A.M., Temperature, 100° F.; pulse, 100; respiration, 40. 6 P.M., Temperature, 103° F.; pulse, 120; respiration, 45.

High enema, one pint of compound infusion of senna, resulted in a good stool.

September 11, Fourth Day.—6 A.M., Temperature, 103° F.; pulse, 98; respiration, 50. 6 P.M., Temperature, 102.1° F.; pulse, 98; respiration, 40.

September 12, Fifth Day.—6 A.M., Temperature, 101.5° F.; pulse, 88; respiration, 36. 6 P.M., Temperature, 103.6° F.; pulse, 88; respiration, 40.

Ducro by mouth retained.

September 13, Sixth Day.—6 A.M., Temperature, 100.5° F.; pulse, 88; respiration, 36. 6 P.M., Temperature, 100° F.; pulse, 86; respiration, 36.

September 14, Seventh Day.—6 A.M., Temperature, 100.3° F.; pulse, 80; respiration, 40. 6 P.M., Temperature, 101.3° F.; pulse, 86; respiration, 37.

September 15, Eighth Day.—6 A.M., Temperature, 101° F.; pulse, 85; respiration, 40. 6 P.M., Temperature, 101.5°; pulse, 110; respiration, 35.

Temperature has been due to pneumothorax and pleurisy on left side and a pneumonia which developed on right side, but, owing to fear of disturbing him, was not diagnosed till September 14. He has complained a great deal of pain in chest and annoying cough, for which, in addition to an ammonia mixture, we have had to use morphine several times.

On September 18 temperature reached normal. A slight exacerbation occurred on 19th, but quickly subsided, and from that time recovery was rapid. He was discharged perfectly well on September 30, having been up about the ward for three days.

On the 17th of September he was delirious for a time, and got out of bed and walked the length of the ward. This seemed to

have been the crisis of his lung trouble, for next morning his mind was perfectly clear and he began to get better.

The records of the Charity Hospital show that from January, 1892, to January, 1901, we had performed laparotomy for penetrating wounds of the abdomen one hundred and fifty-two times, with eighty-seven deaths, a mortality for all cases of 57.23 per cent. Morton (1889) collected 110 cases, with a mortality of 62 per cent; Coley (1890), 165 cases, with a death-rate of 67.2 per cent.

Of our 152 cases, 113 were for gunshot wounds, with seventy-eight deaths, a mortality of 69 per cent.; and thirty-nine were for stab wounds, with nine deaths, or 23.07 per cent.

Distributed by years, our percentages are as follows:

ABDOMINAL SECTIONS.			
	Total.	Died.	Mortality.
1892.			
Gunshot wounds.....	9	5	55.55 per cent.
Stab wounds.....	2	0	0 per cent.
1893.			
Gunshot wounds.....	10	6	60 per cent.
Stab wounds.....	5	3	60 per cent.
1894.			
Gunshot wounds.....	11	7	63.63 per cent.
Stab wounds.....	5	1	20 per cent.
1895.			
Gunshot wounds.....	13	10	76.92 per cent.
Stab wounds.....	4	0	0 per cent.
1896.			
Gunshot wounds.....	24	16	66.66 per cent.
Stab wounds.....	5	0	0 per cent.
1897.			
Gunshot wounds.....	15	13	86.66 per cent.
Stab wounds.....	7	2	28.57 per cent.
1898.			
Gunshot wounds.....	11	7	63.63 per cent.
Stab wounds.....	3	2	66.66 per cent.
1899.			
Gunshot wounds.....	14	11	78.5 per cent.
Stab wounds.....	5	1	20 per cent.
1900.			
Gunshot wounds.....	6	3	50 per cent.
Stab wounds.....	3	0	0 per cent.

Taking now the cases which at operation presented lesions of the viscera, we find them distributed as follows:

	Total.	Died.	Mortality.
1892.			
Gunshot wounds.....	9	5	55.55 per cent.
Stab wounds.....	0	0	0 per cent.
1893.			
Gunshot wounds.....	9	6	66.66 per cent.
Stab wounds.....	0	0	0 per cent.
1894.			
Gunshot wounds.....	9	7	77.77 per cent.
Stab wounds.....	1	0	0 per cent.
1895.			
Gunshot wounds.....	12	10	83.33 per cent.
Stab wounds.....	0	0	0 per cent.
1896.			
Gunshot wounds.....	21	14	66.66 per cent.
Stab wounds.....	3	0	0 per cent.
1897.			
Gunshot wounds.....	12	11	91.66 per cent.
Stab wounds.....	4	2	50.00 per cent.
1898.			
Gunshot wounds.....	9	6	66.66 per cent.
Stab wounds.....	1	1	100 per cent.
1899.			
Gunshot wounds.....	12	11	91.66 per cent.
Stab wounds.....	0	0	0 per cent.
1900.			
Gunshot wounds.....	3	1	33.33 per cent.
Stab wounds.....	0	0	0 per cent.

This table shows 105 cases of gunshot and stab wounds of the abdomen operated upon, with visceral injuries, of which seventy-four died, a total mortality of 70.47 per cent.

Of these 105 cases with injuries of the viscera, ninety-six were gunshot wounds, of which seventy-one died, a mortality of 73.95 per cent. : and nine were stab wounds, of which three died, a mortality of 33.33 per cent.

In spite of the high rate of mortality shown by these tables, I do not think they should discourage the operation. A mortality of 73.95 per cent. in gunshot wounds *with injury of the hollow viscera* means, in my opinion, that 26 per cent. of these patients had their lives saved by the operation; and a death-rate of 33.33 per cent. in stab wounds, with the bowels cut, means that two-thirds were saved from certain death.

I am impressed by the fact that one can never tell from general symptoms or external appearances whether the viscera have been wounded or not. I recall one case of stab wound where I was strongly tempted to let the patient alone, but did make up my mind to operate. I enlarged the wound, and, still impressed by the idea that the weapon had done no serious harm, examined only three or four feet of the bowel that were nearest the wound. Finding no injury, I sewed up the cut, and sent the man to bed. He did very well for two days, when he suddenly had a change for the worse and died in a few hours of violent peritonitis. The autopsy revealed a clear cut through the bowel, just beyond the point at which my inspection had stopped. Since that time, some two years ago, I count time well spent in going over the bowel carefully, and I feel that every penetrating wound of the abdomen should be given the benefit of an operation. Still another case which was brought in about September 10, 1901, has further impressed upon me the necessity for operation, if the case is seen in time. This man had been shot about the pubes thirty-six hours before his arrival at the hospital. Peritonitis was already developed, and no attempt at interference was made. Opium was given freely, and he lingered four or five days. When the body was opened after death, *no injury* of the viscera was found; but the bullet was found lying in the pelvis, together with some fragments of bone from the pubes, and the whole belly was the seat of a violent septic inflammation. Does it not seem probable that, if he could have been treated in time according to proper surgical principles, the bullet would have been found, the pieces of bone removed, and, with sound intestines, the inflammation caused by the dirty bullet prevented? This case, while cited here, is not included in any of the tables, which deal only with those cases upon which laparotomy was performed.

For the records of the cases reported and for their devoted attention to the patients, I feel that my thanks are due to Drs. Allen and Granger, and Messrs. Richards, Cobb, and Lynch, who were at different times the internes in charge of the cases.

THE TECHNIQUE OF GALL-BLADDER AND DUCT OPERATIONS.¹

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IN a short paper on this subject much may be assumed to be the common knowledge and practice of the general surgeon, and may be passed over with simply a brief mention. There are, however, certain differences in methods that are so radical that they call for more careful discussion. The views advanced by the writer have been arrived at as the result of a very considerable number of operations in this region, as well as learned from the successes and failures of others.

Indications for operation are not within the scope of this paper; but I cannot refrain from the remark, in passing, that operations on the gall-bladder are too seldom performed, or performed too late for the best good of the patient. The general practitioner is, however, learning that attacks of pain, and other symptoms pointing to trouble about the gall-bladder, call for the surgeon, as much as do symptoms pointing to the appendix.

Only one word in regard to what may be called preparation: in my opinion the surgeon should *not* wear rubber gloves while performing operations upon the gall-bladder. So much depends upon the sense of touch that even the hand trained to operate, as a rule, in gloves cannot do as good work with as without them.

¹ Read before the Medical Society of the State of New York, October 15, 1901.

The incision to reach the field of operation is best through the outer part of the rectus parallel to its fibres. Should more room be needed, the incision can be carried upward and across the rectus.

The operations usually performed are

- (1) Simple incision of the gall-bladder.
- (2) Removal of the gall-bladder.
- (3) Incision of the cystic or common ducts.
- (4) Cholecystenterostomy.

It is impossible in most cases to determine beforehand which of these procedures may be necessary; and it is only when the abdomen is opened and the eye and hand can explore, that the surgeon is able to map out the operation. Should, as is so often the case in late operations, the gall-bladder and all the surrounding structures be surrounded and bound together by adhesions, these must first of all be thoroughly separated, and the gall-bladder, ducts, and pancreas carefully examined. Stones in the gall-bladder are generally easily detected, even if the organ is enlarged and tense. Small stones in the common and even cystic duct, and still more in the hepatic duct, may easily escape the careless or hasty operator. The best method of examining the ducts by touch is to pass the forefinger of the left hand through the foramen of Winslow, the surgeon's back being towards the patient. The duct, portal vein, and the artery are then easily felt between the finger and thumb. Before proceeding farther, the field of operation should be carefully surrounded by gauze packing in every case, for no one can tell whether the fluid in the gall-bladder will be sterile (as is generally the case) or not.

If the gall-bladder is to be opened, it may best be secured by two ligatures passed through its wall by curved needles. These do much less damage and take up less room than forceps. Should there be a large quantity of fluid in the gall-bladder, it may nearly all be removed by means of an aspirating-needle or trocar, and, if there is reason to think that it is septic, the bladder is easily washed out without the escape of its contents. The bladder is then incised between the two

ligatures, and gall-stones or pus thoroughly removed by scoop, curette, forceps, and syringe.

If it is decided not to remove the gall-bladder, the question arises, Shall we sew it up, as we would the stomach, or drain it? For my part, I believe thoroughly in *drainage in all cases*. Even if the contents are sterile, and we have an apparently normal gall-bladder to deal with, some stone overlooked or driven farther into the duct, a blood-clot, or a swelling of the mucous membrane following manipulation may cause an obstruction of the duct and distention, with perhaps a leak or inflammation. I have in the past sewed up many gall-bladders without, I am glad to say, any bad result; but after having seen autopsies where it has been done by good surgeons, I shall do it no more. What has been called the "ideal cholecystotomy" is to my mind far from being ideal. Drainage of the gall-bladder under these circumstances is like drainage after removal of an acutely inflamed appendix; if there is no need for drainage, the wound will close so soon that only a few days are lost; whereas, if it is needed and not employed, the patient is lost.

Now, how shall we drain? The old and common method of stitching the gall-bladder to the abdominal incision, or even the skin, seems to me to be the most crude and happy-go-lucky method of all. It is impossible for the most expert with the needle to make a tight joint, as can be made, for example, between coils of intestine. Of course, packing can be placed about the gall-bladder, but there is bound to be an escape of bile into the dressing, if not into the abdominal cavity.

The method that I have used for years, since it was first called to my attention, is to tie a glass tube with a flaring end tightly into the gall-bladder, using a heavy silk ligature. The ragged end of the bladder is then trimmed away and it and the tube are enveloped in a small packing. A rubber tube being attached, all the bile for days may be carried through the untouched and unsoiled dressing into a bottle hung below the bed.

Another advantage that this method has is that the gall-

bladder is not put on a stretch to fasten it to the abdominal wall, and the patient has less subsequent pain and dragging in the wound.

Should we wish to remove the gall-bladder, either after or before opening it, the operation is a simple one. There is no need of a cautery-knife or special instrument. The peritoneum being divided at its reflection from liver to gall-bladder, the latter is easily torn out of its bed by the fingers or blunt dissector till the cystic duct is reached, which can be tied and cut, and the operation is done. Sometimes there is quite a space between the cystic duct and artery, and they may have to be tied separately, though not often. I have never seen a hæmorrhage from the torn liver substance that a packing of gauze would not stop in a few minutes.

Mayo's method of dissecting out the mucous membrane is ingenious, and may be useful when the gall-bladder is firmly embedded in adhesions, but in ordinary cases I see no advantage over total extirpation.

Operations for the removal of stones in the common duct are among the most difficult and dangerous of surgical procedures. The surrounding structures are deep, of great importance, and easily wounded. The position of the stone having been determined by the examining finger, it may be removed according to its distance from the bowel and the feeling of the operator, either through the enlarged cystic duct, the incised common duct, the incised duodenum, or even by crushing by external pressure,—a most unsatisfactory method.

Should the stone be situated in the hepatic duct, it may often be grasped by forceps or spoon; but whoever has had much experience in hepatic surgery must have felt the disappointment of having the stone slip farther back into the liver and not be able to reach it again.

Shall we stitch up the openings that we make in the common duct? If we do, it is very convenient to use Halsted's mallets. Personally, I have found that those cases where no sutures are used do as well, if not better, as those where they are.

Cholecystenterostomy is one of the few operations where I still use the Murphy button. I do not see why the elastic ligature might not be used here with the best result.

One thing the operator should always remember is that a biliary fistula cannot be, and really should not be, closed unless the common duct is open.

Among the most trying of surgical emergencies is the hæmorrhage that sometimes follows operations on profoundly jaundiced patients. Nothing is more trying than to see a patient, that has apparently come through a severe operation in good shape, dying of that ghastly oozing that cannot be stopped. The use of gelatine both before and after operation has been suggested. I have had no opportunity to try it. It has occurred to me that finely divided gelatine, sterilized and perhaps mixed with a little adrenalin, might be used on the cut and torn surfaces.

In conclusion, I wish to emphasize the importance in many cases, where the abdomen is opened and the patient is in good condition, of a thorough examination of the gall-bladder and the removal of the stones at least, if they are present, or, as I generally prefer, the gall-bladder itself. The operation should, however, be as carefully and thoroughly done as though it were the primary and not secondary one.

INTUSSUSCEPTION OF MECKEL'S DIVERTICULUM.

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THE following case of intussusception caused by a primary invagination of a Meckel's diverticulum, though adding little from an operative or diagnostic point of view, is still of considerable interest anatomically and statistically. A search through the somewhat limited available literature has shown how rare this exact condition is even with the great increase in the frequency of abdominal operations. Thus, Treves, in his "Intestinal Obstruction" of 1884, mentions only one case preserved in Guy's Hospital Museum which he at this time considered unique. In his 1899 edition Treves adds another specimen from the Royal College of Surgeons' Museum and quotes a case of Adams. He also mentions two cases of the entirely different condition of an invagination of the intestine through a diverticulum patent at the umbilicus. Erdman¹ reports a successful operation for intussusception caused by invagination of Meckel's diverticulum, and Boldt² mentions without detail a case of his "caused by diverticulum." Brunner³ had a case of invaginated diverticulum at the apex of which was an accessory pancreas. Cases of diverticulum, not invaginated, with accessory pancreas are reported from time to time; and, though the condition from a surgical point of view may be the same, it is nevertheless interesting to note that these diverticula are generally considered to be produced by traction of the accessory gland, and not true examples of remaining omphalomesenteric duct. (Fischer.⁴)

Kammerer,⁵ in 1897, discussed rare forms of obstruction by Meckel's diverticulum, but quotes only two of the cases in Treves's work as being of this variety.

Gibson, in a detailed collection of 239 cases of intussusception,⁶ does not mention this form, nor does he in his later series of 1000 cases of intestinal obstruction.⁷

The history of the present case is as follows:

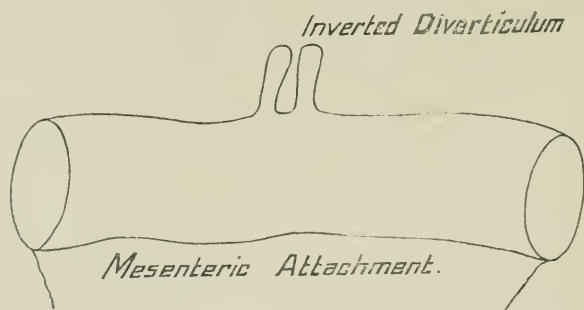
D. M., an American, aged seventeen years, apprentice in a boiler-shop. He was referred to the general service of the Moses Taylor Hospital by Dr. A. J. Winebrake. His habits have been good, he has always been well, and has had no gastro-intestinal disorder. Six days before admission his appetite failed, he had an unusual sense of fulness after eating, and became constipated, so that his bowels did not move from this day up to his admission. He continued at his work, however, until the morning before admission. On this day he did not feel well enough to go to work, but went out for a short walk. On returning home he was seized suddenly with a very severe pain in the epigastric region, so that he "lay on the floor writhing in agony." Morphine was required. From this time on he is sure that he passed no gas by rectum, and he soon began to vomit. Vomitus was dark green, bitter, and was raised without retching. The pain and vomiting continued, the pain being so severe that he was kept awake all night. The next morning he was again seen by Dr. Winebrake, who administered cathartics by the mouth, which were immediately vomited. The breath and vomitus at this time were of foul odor, but not fæcal. A high oil enema was administered, but returned colored only with blood.

On admission to the hospital on the afternoon of the second day, examination revealed a well-nourished patient, face slightly drawn and anxious, tongue dry and coated, breath foul. He did not vomit in the hospital. The abdomen was retracted and board-like. No tumor could be felt, but palpation revealed tenderness all over the lower zone of the abdomen, at which point he complained of great pain. Rectal examination was negative, pulse 80 and of good quality, respiration 20, temperature 99° F. by mouth. In the hospital another high oil enema was given, but returned with blood only.

The presence of an epidemic of severe intestinal colic in some

of the shops from which the hospital draws its patients complicated the diagnosis. However, an operation was decided upon and performed with the assistance of Dr. Reed Burns, at 8 p.m., on the evening of admission, *i.e.*, about thirty-six hours after the acute onset.

Ether narcosis. Median incision from umbilicus to pubes. On opening the peritoneum there was a gush of about eight ounces of clear serum. The small intestine immediately presented in the wound. It was distended and showed a very marked general injection of its peritoneal coat. The sigmoid colon was then found to be collapsed and the cæcum sought. This was also collapsed with the appendix normal. The terminal collapsed ileum was then caught and followed up, and an intussusception about three inches long was found about three feet from the ileo-



Showing the diverticulum inverted after the lumen of the bowel was restored.

cæcal valve. There were as yet no adhesions, and the invagination was easily reduced by pressure on the apex. When the lumen of the bowel was restored, it was found that there was in addition a diverticulum, which was itself inverted. (See Fig.) It was not until this moment that the true condition was known. This diverticulum, the inverted apex of which had evidently formed the apex of the intussusception, in its turn was easily reduced and found to be about one inch long and somewhat less in diameter. The diverticulum was clamped and cut away, and the wound in the intestine closed with silk Lembert sutures.

The abdominal wall was sewed without drainage. Recovery was rapid and uneventful. Flatus was passed freely the night of the operation, and the bowels moved without cathartics the second day.

Microscopical examination of the removed diverticulum showed a complete investment of both muscle layers even at the tip, but otherwise was not noteworthy. That the case was one of a true omphalomesenteric remnant was proved by the presence of its muscular coat, as well as by its situation at the circumference of the gut opposite from the mesentery and by its distance from the cæcum.

An interesting point in the clinical history is the presence of a mild intestinal disorder four days before the onset of acute symptoms. It is entirely speculative as to whether this meant an irregular muscular action during a functional derangement which produced the intussusception, or whether the intussusception occurred at this early moment and for four days remained chronic.

The patient had no external deformities, the presence of which has been suggested by Gibson.

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MECHANICAL VERSUS SUTURE METHODS FOR INTESTINAL APPROXIMATION.¹

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THROUGH the labors of Dr. Senn in 1887 can be attributed the revival of mechanical contrivances for intestinal surgery. Although the devices of the Murphy type are but modifications of that of Denan, whose attempt to unite severed intestines failed not on account of the imperfection of his method, but for the same reason that so many other surgical devices were found to be deficient during his time through a lack of knowledge of aseptic and antiseptic surgery; still, any one acquainted with the literature of the subject will not deny that Murphy's introduction of his button for intestinal operations was a great factor in reducing the mortality in this field of surgery.

The few objections raised against the use of the Murphy button, I have endeavored to overcome in contriving my absorbable coupler, by still retaining the principles and merits of the former. We must admit that, both from a logical and practical stand-point, these exceptions to the Murphy button are drawbacks; but are these drawbacks responsible for the failures reported? Is there any worker in this line who can say with absolute certainty that obstruction, gangrene, perforation, or whichever cause it may be in this or that particular case, or all combined, was due to the Murphy button?

There are many conditions besides "a large, heavy foreign body" which are liable to give such disastrous results. They may be due to faulty steps taken by the operator in his work, as careless ligation of mesenteric branches supplying

¹ Read before the Chicago Surgical Society, May 3, 1901.

intestinal ends, insufficient resection of pathological tissue, the use of too large or too small a button, etc.

Granting that bad results occasionally do occur for which the button is directly responsible, do we not, and did we not formerly, get a much larger percentage of unfavorable results, both immediate and remote, particularly in restoring the continuity of the bowel? Are not the following accidents more apt to occur with the suture methods, first, stenosis at the point of approximation, as a result of cicatricial contraction; second, shock due to prolonged handling and exposure; and, third, leakage from the points of exit and entrance of the needle? Why, then, this cry of opposition against the use of mechanical methods, in spite of the excellent results obtained, which never had been achieved before their revival, and which no one can dispute nor statistics disapprove? There are but few operators prominent in this field of surgery who would not prefer the use of mechanical devices of the Murphy type to any suture method.

Those advocating suture methods generally claim that time-saving is of little importance; nevertheless, they use the button in emergency cases that are almost moribund and where time-saving is a great factor. Any impartial surgeon will readily understand that not only do such procedures contribute towards increasing the death-rate following the use of mechanical devices, but they are in direct contradiction to their own argument. For if such a "dangerous method," as some surgeons call the use of the button, is of value in cases where both general and local conditions of the patient are very low, where the vitality is impaired, and the parts are in a state of paralysis, it ought to be far more valuable in favorable cases. It would be advisable for the suturists to change their opinion and employ suturing in emergency cases and the button in favorable cases, for several reasons: In the first place, they claim that time-saving is not of importance; secondly, in suturing the ends of a bowel where the vitality is good, the peristalsis may be the means of the bowel cutting itself away from the sutures, giving rise to points of leakage;

while in a paralyzed bowel the parts, being at rest, might heal before the oncome of any peristalsis. The button, on the other hand, holds the ends firmly together, and peristalsis is not likely to overcome its firm grasp. Furthermore, there is less likelihood for the onward march of the button to be arrested after it has accomplished its mechanical duty. Hence, not until the trend of opinion changes will the majority of surgeons advocate the use of the button.

Four years ago von Bergmann, Gussenbauer, and Wölfler condemned the Murphy button. A year ago, however, they were all unanimously in favor of the button, especially in end-to-end union. Von Bergmann, a surgeon whose skill in suturing intestines is of the highest perfection, last year in his clinic informed me that for the past three years he has discarded all suture methods, not excepting his own, for end-to-end approximation, and that he uses my coupler for that operation with splendid results, preferring it to any suture method. For gastro-enterostomy he still uses his own suture. Gussenbauer and Wölfler use the button or coupler. Czerny, of Heidelberg, since 1896 has been using the Murphy button in his intestinal work, obtaining a very low mortality; and this is very gratifying, as it is in direct competition with his own method, the Czerny-Lembert suture.

The pioneers and masters of gastro-intestinal surgery are all in the foreground in advocating the principles of the Murphy type. Why, then, not encourage, instead of discourage, mechanical means for intestinal approximation, which have almost reached the acme of perfection, and which more nearly approach the ideal than any suture method devised?

It shall be the principal aim of this paper to convince the profession that from all stand-points the mechanical method of the Murphy type for intestinal surgery is the best, safest, and most ideal. What constitutes, or, in other words, what approaches nearest an ideal method? What are the essential requisites in performing a successful intestinal approximation?

(1) Simplicity of application.

(2) Time-saving.

(3) Uniform coaptation of peritoneal surfaces of the entire circumference of approximated ends.

(4) Arresting hæmorrhage at the point of approximation.

(5) A cicatrix that will not contract to a deleterious degree.

(6) To obtain as nearly as possible histological structures in exact juxtaposition.

(7) Avoidance of infection.

(8) The least disturbance in continuous peristaltic wave at the point of union.

(9) Avoidance of pocketing and shelving.

(10) Reduction of mortality.

(11) Leaving a minimum number of lesions.

Having enumerated the essentials, it will now be necessary to explain each one separately, and ascertain why each of these is necessary to a perfect intestinal union.

1. *Simplicity*.—This alone is a great advantage. It is not always that a specialist is called upon to do such operations; therefore, simple and safe mechanical contrivances, as those of Murphy and my own, will be much safer in the hands of a less skilful surgeon or general practitioner who is called upon to do such an operation perhaps once in a lifetime. We must try to satisfy the majority.

2. *Time-Saving*.—It is a well-established fact that the danger of shock in a protracted abdominal operation, as well as infection due to prolonged exposure, is more likely to occur with the suture methods. It is the opinion of many surgeons, as well as my own, that the question of rapidity in such abdominal operations is of the utmost importance.

3. *Uniform Coaptation of Peritoneal Surfaces* is more favorable to perfect union.

4. *Arrest of Hæmorrhage at the Point of Approximation* is of vast importance in insuring primary union, this being accomplished by the spring element of the button and coupler.

5. *A Cicatrix that will not contract to a Pathological Degree* is required; and the least amount of cicatricial con-

traction produced by the fine linear scar as a result of pressure atrophy greatly lessens this danger.

6. *To put Histological Structures in exact Juxtaposition* is very necessary, as it restores the tube more nearly to its physiological condition.

7. *Minimizing Infection*.—This is more easily avoided by the button or coupler, as there is no needle to carry the infection from the canal into the abdominal cavity.

8. *The Peristaltic Wave* is least disturbed by the minimum amount of cicatricial tissue and the absence of shelving which is produced with the suture.

9. *Pocketing and Shelving* are not of uncommon occurrence after the use of suture methods; this is due to the uneven suturing, particularly in end-to-end union, and the sequelæ to such conditions are well understood.

10. *A Reduction of Mortality*.—This is of the greatest value, for it is to this end that we are striving, and which gives rise to such diversity of opinion. Could I do more than to state briefly that, according to statistics, the mortality with mechanical methods of the Murphy type in non-malignant gastro-enterostomy ranges from 2.5 per cent. to 14 per cent., end-to-end union from 10.5 per cent. to 16 per cent., and only as high as 33 per cent. in malignant cases; whilst with the suture methods the mortality ranges in gastro-enterostomy from 24.5 per cent. to 76.47 per cent., and in end-to-end from 58 per cent. to 100 per cent.?

11. *Adhesions* are less apt to occur by mechanical methods, as the bowel does not require such extensive handling.

Having presented all the facts, I will conclude with the following statements:

(1) That with no other method can be obtained all the excellent qualities in such an ingenious combination as with the mechanical devices of the Murphy type.

(2) None of the suture methods can show such a low mortality.

(3) The perfect holding together of the intestinal ends throughout their entire circumference with the button or coup-

ler, obviating the danger of leakage, has been demonstrated by von Chlumski, who subjected all methods to the hydraulic-pressure test, and demonstrated the inferiority of the suture methods.

(4) For end-to-end approximation, the button and coupler are the only devices that will achieve their greatest triumph, for it is in this operation that the suture methods yield the largest mortality.

THE SYMPTOMATOLOGY, DIAGNOSIS, AND
TREATMENT OF CARCINOMA OF
THE CÆCUM, WITH A RE-
PORT OF TWO CASES.

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THE writers, having each had a case of carcinoma of the cæcum recently under their care, have thought that a detailed account of these cases, and a brief summary of those already reported in the medical literature, together with some remarks on the diagnosis, symptoms, and surgical treatment of this rather infrequent and interesting surgical affection, might not be out of place at the present time. The cæcum seems to be a somewhat infrequent location for this form of malignant neoplasm, if one may judge from the rather limited number of cases that have so far been reported.

The symptoms that are observed during the progress of carcinoma of the cæcum may be divided into functional and physical, and it is generally by the former that the presence of the neoplasm makes itself known in the beginning. The period of commencement is usually remarkable by its latency, but comes to an end as soon as the growth has developed sufficiently to be made out in the right iliac fossa by palpation, and at this time the period of full development has been reached. The symptoms which open the scene do not always follow in

the same order, but, according to the frequency of their occurrence, they may be conveniently classed in the following order, namely, (1) pains; (2) alternating diarrhoea and constipation; (3) loss of flesh; (4) dyspeptic troubles; (5) intestinal hæmorrhage.

Occasionally the functional symptoms are absent, and the disease immediately begins by the symptoms met with when it has arrived at its full development. We thus find cases reported where the tumor in the right iliac region was found to be present before it had given rise to any other symptom, while in another instance, the affection made its presence first known by the formation of a fæcal fistula.

Pain is usually the first symptom which attracts the attention of the patient. At the beginning it has no precise localization, the patient simply complaining of pain in the abdomen; but later on it will become localized in the right side of the abdomen, more particularly in the right iliac fossa, and then the pain will shoot towards the legs, more especially the right one, into the lumbar or sacral region, or towards the umbilicus, as in our cases. In the one case here related, the pain, which followed a traumatism on the abdomen, never completely disappeared after the accident, and this has been the history in several other cases reported. Kraussold has recorded the history of a patient who received a kick in the right iliac fossa; the pain persisted for six years with only slight remissions, and then disappeared completely after a spontaneous fæcal fistula had formed. Pain may be produced by movement, and in one case reported by Péan the patient, who remained in bed lying on the back, felt pains as soon as any motion was imparted to the right leg. Other cases are recorded where pain was set up when the leg was flexed in order to go up or down the stairs. In other cases the pain was greatly increased as the patient became more constipated, and would completely disappear after the bowels had been made to move, while in other cases it was constantly present and *increased during meals*; this symptom was very marked in our cases. At other times, it occurred at regular

intervals and always at the same spot. It would appear that pain is quite an important symptom of cancer of the cæcum, and that in the beginning of the disease it is the one above all that is noticed, and it is very often to get relief that the patient consults his physician.

During the first part of the evolution of the disease an alternating diarrhœa and constipation are nearly always present. Sometimes these alternatives follow vomiting, while in other cases an alternating diarrhœa and constipation are finally entirely replaced by a continuous diarrhœa, which will most likely be relieved by some astringent mixture containing opium; but, nevertheless, the diarrhœa may become uncontrollable, and even be the cause of death. In other cases, constipation becomes more and more obstinate and may give rise to symptoms of intestinal obstruction. There is hardly any case recorded where sooner or later the circulation of the fæces did not become sufficiently difficult to produce more or less severe accidents; but the obstruction was in most cases simply temporary, and by proper medical treatment the bowels were made to move.

In other cases diarrhœa has alone been present, and may exist for a long time; the liquid fæces have no particular pathognomonic sign, but occasionally blood and pus, or pus alone, may be present.

Violent intestinal colic may be added after a time to the alternatives of diarrhœa and constipation, and finally become most excruciatingly painful and constantly present, so that some preparation of opium will have to be administered at frequent intervals. These colics are the result of violent contractions of the intestine, which is obliged to contract in order to overcome the obstacle opposed to the circulation of the intestinal contents by the neoplasm, and they reach their maximum of intensity when complete obstruction of the bowel has been produced.

Some patients become thin and lose their strength at the very beginning of the affection, and the loss of flesh may be very rapid and marked. In one case reported the loss of flesh

reached such a point that the patient was thrown into a very advanced state of cachexia with a yellow coloration of the integuments, but which did not resemble the straw-color tint of a cancerous subject. It is sometimes with much difficulty that one can appreciate the degree of loss of flesh, because many patients do not know their weight in health and do not carefully record their condition.

Digestive disturbances have been frequently noted in the initial period of carcinoma of the cæcum, and they may be more or less marked. They consist principally of nausea, vomiting, anorexia, and difficult digestion. The vomitus is usually mucous in nature, but it may become bilious and contain food. It may become fæcal if symptoms of occlusion arise, and may subside spontaneously or by an appropriate treatment. In one case fæcal vomiting occurred one year before a tumor could be palpated.

Vomiting has been observed when the intestinal obstruction was not very marked. In other cases the vomitus was yellow and had a fæcal odor, but was not fæcal in nature; while other patients have had a fæcal taste in their mouth without having fæcal vomiting. A long time ago Desprès pointed out that when yellow vomitus with a fæcal odor occurred, or when patients complained of a fæcal taste, carcinoma of the intestine should at once be suspected.

To sum up, it may be said that the dyspeptic disturbances met with in cases of carcinoma of the cæcum are in the first place of slight degree, but later, when they take on a fæcal character, the existence of this disease should be suspected.

Intestinal hæmorrhage is not a frequent symptom in carcinoma of the cæcum. Small hæmorrhages may occur which color the fæces black, but in other cases, although few in number, the hæmorrhage may be sufficiently abundant to become serious. The blood of the intestinal hæmorrhage was mixed with pus in one case.

It is during the second period, that is to say of full development, that the physical symptoms are observed, and they characterize the disease. The most important of all is the

appearance of a tumor in the right iliac fossa. In the beginning the tumor is movable under the abdominal wall and also over the deeper structures. If it is held between the fingers it may be given almost any movement, and at this time the mobility of the growth is not influenced by inspiration or expiration. The neoplasm, which in the first place is limited to the intestine, will finally invade the pericæcal cellular tissue, set up narrow adhesions between the diseased intestine and the iliac fossa, or the growth may become adherent with the abdominal wall. Later on, the lymphatic glands become involved, and their number and size vary very greatly in one case from another.

After the lymphatics have become greatly involved a considerable tumor is produced, which may cause a projection at a point quite distant from the seat of the primary cancer, as, for example, at the umbilicus or the epigastric region. The tumor, which up to this time was quite movable, or only slightly adherent, becomes fixed to the deeper structures, and may also adhere to the abdominal wall. In some cases, however, it retains an appearance of mobility and follows the movements of respiration, although it is adherent everywhere, even to the duodenum. In one case reported, the tumor became immovable from a shortening of the mesocolon, although there were no adhesions. It may also happen that the tumor compresses the iliac vessels, in which case an œdema of the right lower limb will ensue.

It does not necessarily follow that, because the lymphatic glands are increased in size, they are the seat of secondary deposits of carcinoma; and in a case recorded by Bouley, the lymphatic glands had undergone considerable hypertrophy, but were not carcinomatous. This was simply a case of simple hypertrophy and chronic inflammation of the glands, and this fact also applies to many other instances of lymphatic enlargement in cases of carcinoma originating in other organs. If it could be proven that in the majority of cases of carcinoma of the intestine the lymphatic glands remain for a considerable length of time without becoming involved by secondary de-

posits of the growth, it would be an argument most decidedly in favor of a radical operation.

We would here make a few observations on the proper method of exploring the cæcum. By careful palpation of the right iliac fossa, it is quite possible to feel beside the cæcum a loop of intestine about the size of the index-finger. This loop, which is situated at the bottom of the right iliac fossa, is about six to eight centimetres long, and extends obliquely from above downward and from without inward. Its upper end is in relation with the external aspect of the cæcum, while the lower end is located nearly in the neighborhood of the external margin of the rectus muscle. A line drawn from one anterior superior iliac crest to the other divides this loop into two equal parts, and the meeting-point of the loop and that of the line drawn from the iliac crests is situated at about seven centimetres from the anterior superior iliac crest on the right side. This loop of intestine is the terminal part of the ileum where it joins the cæcum. This fact was first demonstrated by Obratzow; and he has also discovered at the bottom of the abdominal cavity the presence of several glands of the mesentery whose size could be made out. This was done by pressing over a region limited inwardly by the external border of the rectus muscle and externally by the internal border of the ascending colon.

To palpate the ileum, four fingers of the right hand are held perpendicularly to the long axis of the intestine to be explored. Now, since the long axis of the ileum is directed from the pelvis towards the cæcum, nearly parallel to Poupart's ligament, the direction of the fingers used in palpation should necessarily be perpendicular to this ligament. Since it is known that it exists at a distance of seven centimetres between the anterior superior iliac spine on the right and the ileum, at a point where this loop of intestine meets the line drawn between the two crests, all that is necessary is to measure this distance and to push the fingers into the right iliac fossa at the point thus determined, in order to find the intestinal loop in question.

Palpation should be practised with great delicacy and

gentleness, and the patient should be requested to take deep breaths in order to avoid contraction of the abdominal muscles. To find the enlarged lymphatic glands of the mesentery, four fingers of the right hand placed near the external border of the rectus muscle on the level of the umbilicus should be pushed deeply down into the abdominal cavity during deep inspiration, when they will encounter the angle formed by the ileum and colon, which is the point where the hypertrophied lymphatic glands of the mesentery will be found.

If the abdomen is distended, or if pain is so severe that palpation cannot be properly carried out, ether should be given. If the tumor is deeply situated, and if it is difficult to explore, the colon may be prudently distended with hydrogen, which will cause the tumor to become more prominent.

The physical characters of the tumor found will vary. Sometimes it is rounded, the size of a small walnut, with a hard, smooth surface, and on percussion there will be dulness. At other times the surface is irregular and lumpy, while the tumor may be the size of a fist or even larger, hard in some places, soft in others. Between these extremes a large variety in size and shape will be found. Sometimes tympany will be elicited by percussion, and when this is present, it is caused by the interposition between the abdominal wall and tumor of dilated loops of intestine.

In a certain number of cases ascites has been present; but it is difficult to say whether the liquid was due to the involvement of the peritoneum by carcinomatous granulations, or whether it was due to a simple peritonitis localized in the region of the cæcum. Œdema of the right lower limb may result from compression of the venous circulation by the tumor in the iliac fossa, but it may also be the result of a thrombosis of the femoral or iliac veins.

After the functional symptoms have been present for a variable length of time, the tumor in the region of the cæcum makes its appearance: it is usually, in the first place, small, movable, and localized to the cæcum, but very soon it increases in size, invades the neighboring tissues, and becomes bound

down by adhesions. From the increase in the size of the growth, the lumen of the intestine becomes smaller and smaller, whether due to a concentric development of the tumor within the wall of the cæcum, or from its development eccentrically, in which case it compresses the gut. We then get the symptoms of a periodical and temporary occlusion, or the obstruction may become permanent, resulting rapidly in death. The lumen of the intestine may suddenly become obliterated by the presence of foreign bodies in the fæces, while in other cases the growth forms an annular stricture including the entire circumference of the gut. Sometimes the neoplastic formation forms a sessile polypoid mass, which by becoming invaginated gives rise to all the symptoms of intestinal invagination.

It is impossible to say what may be the exact duration of the disease, because the exact date of its commencement is unknown. In the first place, the functional symptoms are insufficient to distinctly characterize the disease, while on the other hand, as long as it is impossible to make out the presence of a tumor in the right iliac fossa, the diagnosis must naturally remain uncertain. In all probability, however, a carcinoma of the cæcum does not in most cases take longer than a year or eighteen months to accomplish its evolution.

A carcinoma of the cæcum exposes the patient to a large number of complications, due either indirectly or directly to the neoplasm. As the tumor grows, it may invade the skin and the muscular layers of the abdominal wall quite extensively, and when it invades the structures composing the iliac fossa, the growth becomes completely immovable and all radical treatment is then impossible. Generalization of the growth by continuity in the mesentery and its lymphatics is not infrequent. The peritoneum generally may become invaded, while, if the serous membrane covering the diaphragm becomes involved, a right-sided hæmorrhagic pleurisy may result. Metastases may take place in the liver or lungs.

A chronic peritonitis by continuity may arise without any metastasis taking place in the peritoneum, and may or may not be accompanied by ascites. Septic peritonitis from perfora-

tion of the cæcum, or the ascending colon, may also result; or an intestinal fistula opening into the anterior abdominal wall may occur. A case is reported where an abscess of the internal iliac fossa formed and burrowed into the gluteal region, perforating the iliac fascia. Thrombosis of the femoral, external, and primary iliac veins may also arise. Intestinal obstruction and invagination are not, properly speaking, complications of cancer of the cæcum, but are two of the ways in which the patient is carried off if the disease is left to itself.

The positive diagnosis of carcinoma of the cæcum is of course based on the presence of the symptoms that we have already enumerated; but we would here say that a wise precaution to take before examining patients suspected of being afflicted with this disease is to thoroughly empty the intestine by proper purgatives and enemas, in order to eliminate the possibility of a diagnosis of fæcal impaction. The functional symptoms alternating diarrhœa and constipation, colicky pains, vomiting, intestinal hæmorrhage, pain, especially when it is localized in the iliac fossa, and loss of flesh would naturally draw the surgeon's attention to the cæcum.

An examination of the urine, more particularly for the percentage of urea, might possibly help in the diagnosis, because it is generally known that in carcinoma, in general, the excretion of urea is very notably diminished. The presence of indican would only go to show that there was incomplete elimination of the intestinal contents, resulting in an intestinal auto-toxæmia.

In making a differential diagnosis, we must consider whether symptoms of intestinal occlusion are present or absent; and we will first consider those cases where they are wanting. Tuberculosis of the cæcum is the disease with which an erroneous diagnosis is most likely to be made, and sometimes this mistake is impossible to avoid. Now, in point of fact, tuberculosis of the cæcum in the beginning presents the same functional signs as carcinoma of the organ, namely, intestinal disturbances with alternating diarrhœa and constipation, violent colics occurring in repeated attacks at variable

intervals of time, accompanied sometimes with vomiting, abdominal pains which are in the first place indistinct without any precise localization, but which become after a time localized in the right iliac fossa. Blood in the fæces rarely occurs in tuberculosis of the cæcum. From this it may be seen that in the beginning of the disease it is practically impossible to differentiate tuberculosis from carcinoma of the cæcum.

Later on in its evolution tuberculosis of the cæcum takes on the clinical appearances of a tumor situated in the right iliac fossa, and it also presents the same clinical characters as carcinoma of the organ; but the lymphatics of the mesentery become enlarged much more rapidly, and perhaps more extensively, than in carcinoma.

The tumor formed in cases of tuberculosis is perhaps somewhat less lobulated than a carcinomatous growth; but the difference is so slight that it could hardly be taken into serious consideration. Later on a tubercular process of the cæcum may give rise to a diffused thickening in the iliac fossa, and then the tumor may become softened, and the skin, which is adherent to the underlying structures, becomes red and thin. A suppurative process becomes established, and fistulous tracts which give exit to a purulent discharge make their appearance. Bacteriological examination of the pus and inoculation of animals will clear up the diagnosis, but all this takes time, and in practice is of little value.

Chronic adenitis of the iliac lymphatics most frequently arises either from a tubercular lesion of the corresponding lower limb, or from a lesion having its seat in the territory of these glands. But in these cases the dyspeptic disturbances are absent, and by palpation one may feel a chain of indurated glands, usually commencing below the crural arch and extending into the pelvis. These glands rapidly increase in size and are not long in becoming agglomerated.

Actinomycosis may simulate carcinoma of the cæcum, like it does most any other tumors arising in the iliac fossa. The process may compress the intestine and give rise to symptoms of intestinal obstruction, but after a certain time it simulates

a tubercular abscess, and the tumor extends either towards the lumbar region or below towards the inguinal region. An exploratory puncture will withdraw a grumous liquid, and microscopical examination will quickly settle the diagnosis.

A carcinoma of the cæcum could hardly be mistaken for an acute attack of appendicitis, because in the latter affection the temperature, pulse, and other symptoms all point to an acute septic process; but on several occasions carcinoma of the cæcum has been mistaken for a chronic appendicitis by surgeons of eminence; and this can be easily accounted for when we consider the clinical picture, which is so varied, of the chronic form of inflammation of the appendix.

As to dilatation of the stomach, we have a depression in the epigastric region, and a prominence of the hypogastric region, in the severe cases; but the relief obtained and the slight diminution in the size of the hypogastric tumor after vomiting has taken place, the increase of the patient's suffering and of the weight and size of the tumor after food has been taken, the disturbances of digestion, loss of flesh, should, when present at the same time, lead one to favor gastroptosis and gastrectasis as the probable diagnosis. To these symptoms of dilatation of the stomach, the following should also be added in order to surely recognize the affection, namely, the splashing sound obtained by palpation and also by the ingestion of a seidlitz powder, which will immediately cause the stomach to distend, and thus distinguish it from the cæcum.

In carcinoma of the stomach we have alimentary vomiting occurring soon after, or some time after, food has been taken, according to the site of the neoplasm, or vomiting of certain substances taken during the meal, while others are perfectly digested and not vomited. In carcinoma of the stomach hæmorrhage occurs, and the blood accumulating in the organ is partly digested in the stomach; then it is thrown off in the form of the so-called "coffee-ground" vomit. The presence of a tumor in the epigastric region, and analysis of the gastric contents, will also help in the diagnosis, for in most cases of

carcinoma of the stomach hydrochloric acid is persistently absent.

Carcinoma of the cæcum has been frequently mistaken for a tumor of the kidney; and we all know to what an enormous size a renal neoplasm may reach. When it has become very voluminous it may fill the larger part of the abdominal cavity, so that it is difficult to say what organ is really the seat of the disease; but usually speaking, when it has attained these large dimensions, the growth will be found to occupy a circumscribed part of one of the sides of the abdomen between the iliac crest and the border of the ribs. The cæcum and lower part of the ascending colon are pushed outwardly, while the upper part of the ascending colon crosses the tumor anteriorly. By palpation and percussion we can usually recognize the large intestine. In carcinoma of the kidney the patient has a frequent desire to micturate, and expulsion of the urine is difficult; albumen is only present when hæmaturia coexists. Œdema of the lower limbs and ascites may also take place.

Symptoms of intestinal occlusion arise in other varieties of carcinoma of the intestine, but they are by far more frequent when the growth is seated in the valve of Bauhin. When a patient is seen with symptoms of intestinal occlusion, the orifices through which hernia becomes engaged should be in the first place explored. Now, when no hernia is found to exist, another cause for the symptoms must be looked for. The general shape of the abdomen will approximately indicate the seat of the obstruction; and when there is a distention of the periumbilical region and the epigastric region with a depression over the iliac fossæ, the site of the obstruction is probably in the middle part of the small intestine. When the obstruction is located in the descending colon or the sigmoid flexure, there is a generalized distention, with a projection of the distended large intestine, which forms a kind of prominence around the median distention. Vomiting takes place at a later period than when the obstruction is in the small intestine, and the amount of urine excreted is all the greater the lower the obstruction. The quantity of liquid introduced into the intestine by high

enemas is very useful for ascertaining the site of the obstruction; to fill the rectum a litre of liquid is necessary, and if not more than a litre and a half can be introduced it is probable that the obstruction is seated in the sigmoid flexure. If more than a litre and a half can be introduced, the obstruction is seated farther up. The cause of the obstruction is sometimes quite difficult to discover, and when due to cancer of the cæcum it is often only by elimination of other affections that a diagnosis can be arrived at.

In invagination there is a tumor, and a seropurulent liquid, or even a hæmorrhagic fluid sometimes holding *débris* of gangrenous intestine in suspension, is discharged, and which are characteristic of intestinal invagination when it has been present for a certain time,

A volvulus occurs suddenly after a heavy meal or from violent exercise taken during digestion. When a volvulus has taken place, that portion of the intestine included in the torsion is usually made up of the sigmoid flexure considerably distended and having acquired a diameter four or five times greater than in the normal state. This dilated loop of intestine is always *in front* of the intestinal mass, and occupies the hypochondriac, hypogastric, and epigastric regions, covering the colons and small intestine, and is completely interposed between the abdominal wall and the rest of the intestinal mass. The pedicle is to be found on the left and below the loop which has undergone torsion, in the iliac fossa at the upper part of the true pelvis.

The only radical treatment for carcinoma of the cæcum is total extirpation; but when the patient is weak, so that a long operation practically means death, it should not be considered. When the neoplasm adheres intimately to the structures in the iliac fossa, and to the abdominal wall, it is a contraindication for resection. This operation is also contraindicated when a mass or a chain of lymphatic glands can be made out by palpation, or when metastasis has already taken place in the lungs or liver. Resection should not be undertaken when there is a thrombosis in the femoral vessels.

If the neoplasm is movable or only slightly adherent, and if the patient is in a good enough condition to justify a rather long operation, resection of the cæcum should be done. In certain doubtful cases, that is to say, before the abdomen is opened, laparotomy should be performed and the condition of affairs explored, and then, if the neoplasm cannot be removed, the incision may be closed. This is quite justifiable, because many cases are recorded where the general condition of the patient has been greatly improved after an exploratory laparotomy. If a true occlusion has taken place, the condition of the patient must guide the surgeon as to what is proper to be done. A long operation certainly means death, and if no operation is done the patient will not survive; under these circumstances an operation of short duration may be attempted with a fair degree of success, namely, an artificial anus; and after this has been done we may hope that the general condition of the patient will improve to such a point that after a short interval of time the abdomen may be opened and extirpation performed.

If we are dealing with an invagination of the intestine produced by a carcinoma of the cæcum, resection is the best treatment, because an artificial anus, although removing the dangers of obstruction, leaves the invagination intact, and both these dangers are removed if resection is performed. MacCormac in one case performed resection of the invaginated cæcum and made an artificial anus. He tried several times to close this, but was unsuccessful; the fistula finally closed up without treatment. Consequently, the entire invaginated portion of the gut should be resected, no matter how long it may be, and the invagination should never be reduced, because, if even only a small portion of the intestine is involved, this is a dangerous proceeding, far more so than resection of a long piece of the gut. Lauenstein removed seventy centimetres of intestine in a case of invagination without trying to reduce the lesion, and followed this with an enterorrhaphy; the success was so brilliant that the patient left the hospital three weeks later.

The operative technique of resection of the cæcum comprises the following five steps: (1) the incision of the abdominal wall; (2) the liberation of the intestine; (3) resection of the cæcum; (4) enterorrhaphy or anastomosis; (5) closing the abdominal incision. The abdominal incision should be made over the cæcum, and the best, to our way of thinking, is a curved one at least fifteen to twenty centimetres long; it should be made exactly like the one employed for the ligature of the iliac artery. This incision appears to us to give the greatest amount of room, which is an absolute necessity in the operation under consideration. Some surgeons have recommended an incision in the lumbar region on the ground that exploration of the diseased parts is easier, the drainage is better, and that the peritoneum is not opened. But if a surgeon is clean, the operation can be carried out to better advantage through the incision already recommended; but when in doubt as to the exact nature of the condition, an incision in the linea alba, or along the external border of the rectus, is to be selected.

Now, when the incision has been made and the peritoneum opened, the tumor may either show itself in the form of a thickened cæcum or the neoplasm may be covered by loops of intestine which are quite often adherent to it, or, on the other hand, the mesentery may be adherent to it either above or over it. It is usually easy to separate or tie and cut off the latter; but if the small intestine adheres very strongly to the growth, it should be carefully peeled off and pushed aside by sponges; in some cases, however, a loop or a part of a loop of the intestine has been cut through from necessity.

The ileocolic segment is found either movable or bound down; if it is movable, extirpation is a simple matter, because the mobility of a normal cæcum is very considerable, for it is surrounded in its entire circumference by the peritoneum, and, so to speak, floats in the right iliac fossa. But we rarely meet with this condition of affairs; and when the peritoneum has been opened, we usually find an irregular mass, varying in size from a large walnut to a fist or even more,

bound down in the iliac fossa, sometimes adherent and agglutinated to the small intestine, sometimes completely adherent to the abdominal wall, whose entire thickness has become infiltrated by the neoplasm. The small intestine enters the cæcum at its inferior and anterior aspect, while the ascending colon enters at its upper and posterior surface. It should not be forgotten that the tumor cannot generally be drawn out through the wound on account of the fixed part of the ascending colon to the posterior abdominal wall. There are several operative measures by which we can mobilize and isolate the ileocæcal loop which is invaded by a growth. Baillet advises to section the ileum in the first place, and then to detach the tumor in the iliac fossa by dissecting it out from below upward, and attacking it preferably by its external aspect; and when the upper limit is reached it should be raised up and progressively thrown back; the ascending colon is then cut across and, last of all, the pedicle formed by the mesentery is tied and cut off.

Körte completely mobilizes the tumor before he cuts the intestine. He first ligates and cuts all the surrounding adhesions which are nearly always present, and then mobilizes the tumor by ligature and section of the mesentery, commencing with that of the small intestine. A chain ligature is then made in the mesentery of the small intestine, including the two layers together, or separately, if this is not possible, at the limit of the diseased structures. When dealing with the mesentery of the ascending colon, which is very short, the median layer and the lateral layer will have to be treated separately. When the median layer is cut, clamps must be placed on the tissues in order to prevent the retrograde hæmorrhage which comes from the intestine; and then, by considerably retracting the border of the incision, the lateral layer may be attended to; here oftentimes dense adhesions may be present. These are separated with a dull instrument, or removed with the rest of the mass, if it is suspected they are invaded by the tumor. The serous membrane is tied off before it is cut, in order to avoid hæmorrhage coming from a number of thin-walled vessels, and which may be quite considerable. Then with blunt scissors the

retroperitoneal part of the colon which is not covered by peritoneum is peeled off from its underlying part inserted on the iliac fascia. It oftentimes happens that parts of the growth must be removed which have grown in this direction, and in doing this great care must be taken not to injure the ureter or the iliac vessels. The tumor has now become completely mobilized, and then the intestine may be sectioned. Other operators begin by cutting through the small intestine and the colon before mobilizing the tumor, and this is done as follows: The cæcum having been freely exposed by the incision, the small and the large intestine are cut between two clamps at a sufficient distance from the lesion; the intermediary part is then freed of all its connections either with a blunt instrument or by tying off and cutting the adhesions. In this case the surgeon should proceed from above, working inwardly and then coming up on the other side of the growth. In this operation, hæmostasis, which is long and complicated, having been accomplished, the ileum and the colon are to be united. Their union cannot be directly done by a circular suture on account of the difference in the calibre of the two ends of the gut, and it is better accomplished by lateral anastomosis. The posterior peritoneum must then be sutured in order to repair the rent produced by the removal of the cæcum, and thus close off the peritoneal cavity on this side.

The section of the intestine should be done in completely healthy tissue sufficiently removed from the limits of the neoplasm. There are several ways to prevent the exit of fæces, but by far the cleanest is by the use of clamps as shown in Fig. 1. The clamps may be covered with rubber tubing; but we have rarely seen the necessity of this, because, with the elastic clamps now obtained in the market, we never get any very considerable crushing of the tissues. After the clamps have been placed on the intestine, it is cut through with scissors and separated from its mesentery to a limited extent. The mesentery should be cut between two curved clamps whose ends meet, forming an acute angle, or the mesentery may be tied off with a chain ligature. The intestine may be removed

with a triangle of the mesentery, or it may simply be cut from the mesentery along its insertion. Not the smallest portion of the intestine should be left without its mesentery, because gangrene will certainly ensue. MacCormac advises cutting the intestine obliquely, so that more of it can be resected on its free border than where it is joined to the mesentery, and in this way we have an abundance of the latter. After resection the intestinal surfaces are carefully sponged off and disin-

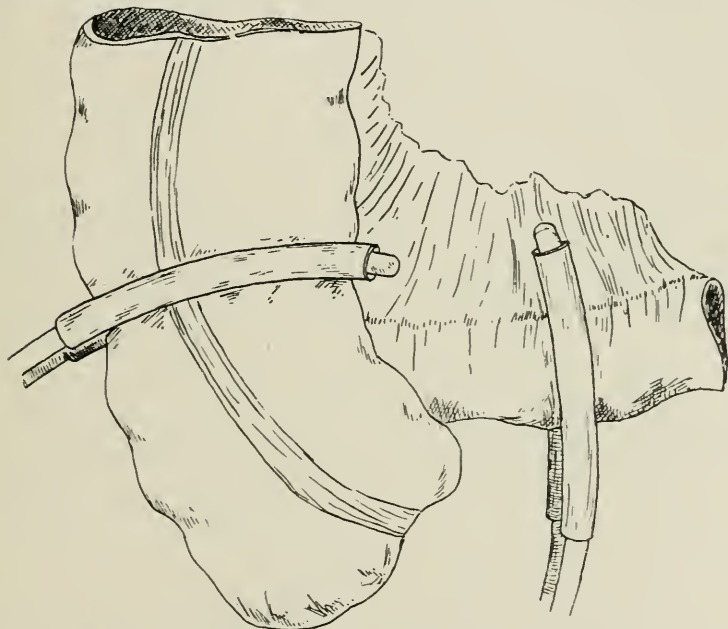


FIG. 1.—Method of applying the clamps to the ascending colon and ileum for obtaining coprostasis in total resection of the cæcum.

fected. They are then left alone until the tumor has been mobilized and isolated, as we have already indicated.

The superior and inferior ligament should be cut between two clamps, or after a chain ligature has been applied; and the latter method is probably the best because of the size and number of vessels in this region. If the neoplasm is adherent to the iliac fascia, it should be peeled off, preferably with the fingers; and to accomplish this with ease and nicety we would strongly recommend the use of cotton gloves for this purpose.

On account of the great adhesion of the growth with the iliac fascia, it is sometimes necessary to remove a part of the latter along with the growth, but in this case great care must be taken to avoid wounding the ureter and iliac vessels. We know of no case where the vessels have been injured, but the ureter has on several occasions been wounded. Czerny immediately performed nephrectomy after wounding the ureter during extirpation of the tumor, and other cases are recorded where the ureter was involved so extensively in the neoplastic mass that it was impossible to completely remove the latter, so that it was obliged to be cut out in order to render extirpation possible.

If enlarged lymphatics exist, it is usually possible to remove them along with the mesentery; but care should be taken not to resect the mesentery in too great an extent in relation to the segment of intestine removed. If, consequently, this resection of the mesentery will have to be too extensive, the lymphatic glands must be peeled out separately.

If we are dealing with a case of invagination of the intestine due to carcinoma of the cæcum, the whole invaginated part and the tumor should be resected without endeavoring to reduce the invagination, as we have already pointed out.

When the neoplasm has been removed, the third step in the operation has been arrived at, namely, entero-anastomosis, and the various methods by which this may be accomplished will now be considered.

Enterorrhaphy is performed under these circumstances by the same methods and technique applicable to all cases where two ends of intestine of unequal diameter are to be united. In the case of resection of the cæcum, we must unite the ileum to the colon in spite of the disproportion in the calibre of the two sections of gut. To accomplish this several techniques have been employed and recommended, namely, (1) decreasing the size of the orifice of the colon; (2) increasing the calibre of the ileum, (3) closing up both ends of intestine and making an anastomosis between the ileum and the colon; (4) closing the colon and making a lateral implantation of the ileum into the colon. A large number of procedures have been recom-

mended, but we will only describe those which in our opinion are the most practicable. The first is to be done as follows: Decrease the calibre of the colon by suturing its borders one to the other just sufficiently to leave an opening having the same dimensions as that of the calibre of the ileum; then suture the ileum to the colon as in an ordinary end-to-end anastomosis.

Another technique, which is preferred by Jeannel, consists in suturing the ileum to the colon in the first place, only

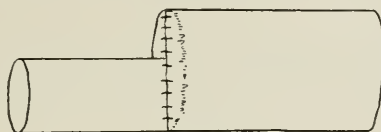


FIG. 2.

adapting the complete circumference of the ileum to part of the circumference of the colon, and then closing the borders of the section of the colon which have not been used for the enterorrhaphy of the ileum; Wölfler's suture should be employed (Fig. 2).

Madelung's technique consists in excising out of the colon on its surface directly opposed to the insertion of its mesentery a triangular piece, so calculated that after the borders of the

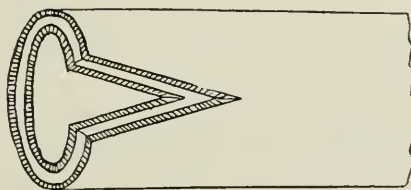


FIG. 3.

excised wound have been united by longitudinal enterorrhaphy the diameter of the opening of the colon will be equal to that of the ileum (Fig. 3).

Doyen has applied his technique of circular enterorrhaphy by double invagination to resection of the cæcum. The ileum is turned back and invaginated for about three to four centimetres (Fig. 4). The diameter of the oblique or perpendicular section of the colon is reduced in its upper part by a

longitudinal suture comprising all the intestinal layers just enough to preserve an opening equal in diameter to that of the ileum. The ileum, still turned back at the end, is introduced through this orifice into the colon, and is united by a total

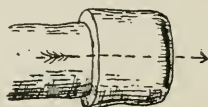


FIG. 4.

suture of the small intestine to the borders of the orifice of the colon into which it has been inserted (Fig. 5). When this suture is finished, the invagination of the ileum into the colon

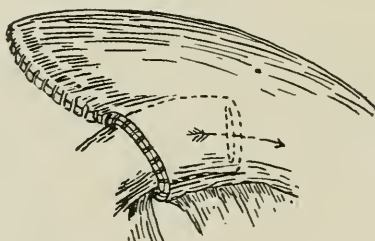


FIG. 5.

is increased a few centimetres, which produces an invagination within the colon itself, in such a way that the serous coverings of the ileum and the colon are in apposition. The handle of the

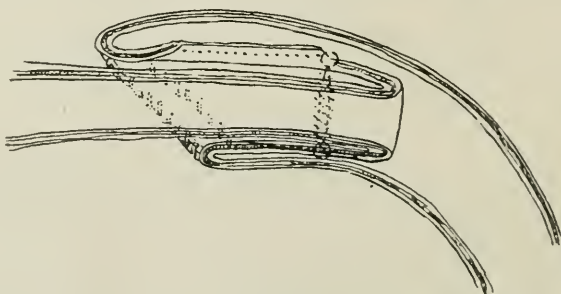


FIG. 6.

racquet thus becomes included in the calibre of the colon. A row of sutures now assures coaptation; the colon is then invaginated a few centimetres more by little pressure, and then

a second row of sutures definitely fixes the invagination (Fig. 6).

Murphy simply uses his largest sized button without decreasing the size of the lumen of the colon; but it must be remembered that he has only done this on dogs; and it would seem to us that his button, which is a good fit for the colon, would so distend the ileum that gangrene might result.

Maunsell has proposed three manners of intestinal anastomosis after excision of the cæcum. In the first a suture is placed in the colon at its union with the mesentery (A, Fig. 7); at a point which corresponds to the diameter of the ileum a

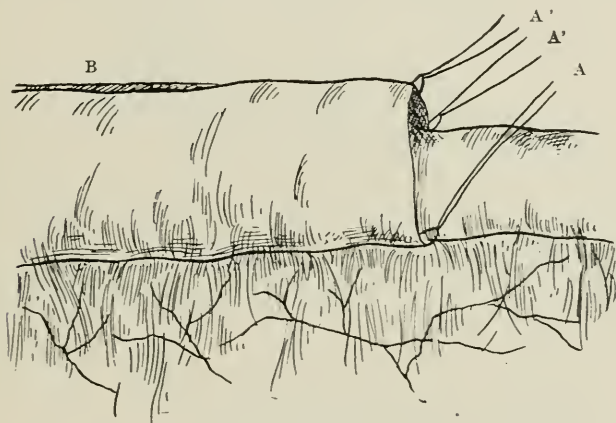


FIG. 7.

loop of silk (A') is brought in and out through the mucous membrane, and includes the entire thickness of the wall of the colon in front and behind and the entire wall of the ileum at a point just opposite the insertion of its mesentery. Lastly, the colon is transfixed by a silk suture at a point just opposite the insertion of its mesentery (A''). A longitudinal incision is made in the colon (B) having the same length as the diameter of the colon; the three sutures, A, A', A'', are drawn through this opening so as to produce an invagination and a hernia of the unequal calibres of the large and small intestines (Fig. 8). The ileum and the colon are in exact approximation between the point A and A'; they should be brought together

by ten diametrical sutures, and the twenty-two knots are tied. There then remains a sort of flap of the colon between A' and A'', invaginated on itself, so that the two serous surfaces are in contact, and on this flap a series of sutures are placed taking

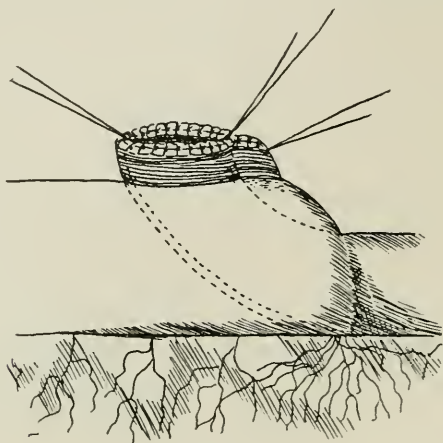


FIG. 8.

care of the angle near A''. Then reduce the invagination and close the longitudinal incision, and the result will be as seen in Fig. 9.

The second technique consists in making a longitudinal

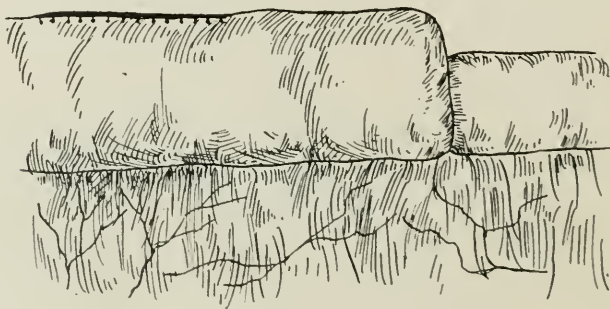


FIG. 9.

incision on the side of the colon, situated at about six and a half centimetres from the point of section, and having the same length as the diameter of the colon, and into this incision the end of the ileum is inserted and held in place by two su-

tures, one of which includes the mesentery of the ileum (Fig. 10). Through the open end of the colon these two sutures

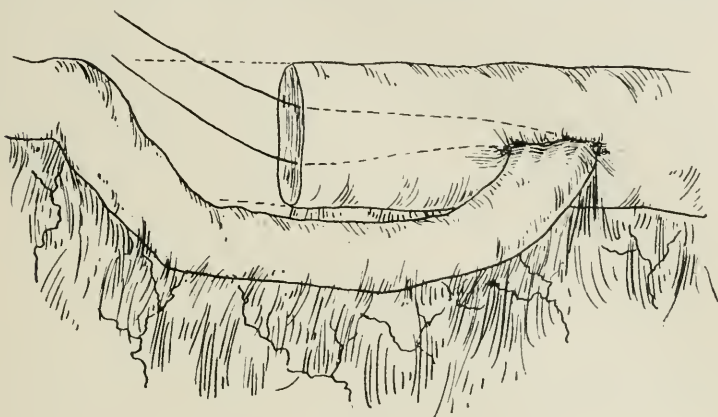


FIG. 10.

are caught and brought down; they should be pulled upon and an invagination made until a hernia of the sectioned surfaces of the gut has been produced. Twenty-two sutures are then introduced; the invagination is reduced and closed, and the longitudinal opening is then sutured in its turn.

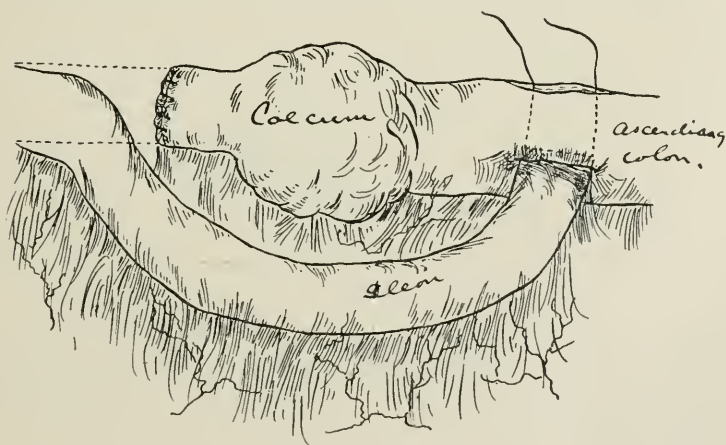


FIG. 11.

The third technique is employed in cases where the cæcum and its neoplasm cannot or ought not to be resected. The ileum

is first cut through, and its opened end is invaginated and closed by sutures. At a considerable distance from the neoplasm two longitudinal incisions, which are equal and parallel and about three or four centimetres apart, are made in the colon. One of these incisions receives the insertion of the upper end of the ileum, while the other is to be used for producing an ileocolic invagination. Twenty-two sutures are then inserted,

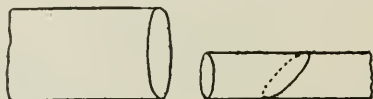


FIG. 12.

the invagination is reduced, and the second longitudinal incision is closed (Fig. 11).

There are two ways by which it is possible to increase the calibre of the ileum. In the first, the ileum is cut obliquely, starting from its free side towards its mesentery, so that the resulting elliptical section will have the same dimensions as the calibre of the colon (Figs. 12 and 13).

The second technique consists in making a slit in the

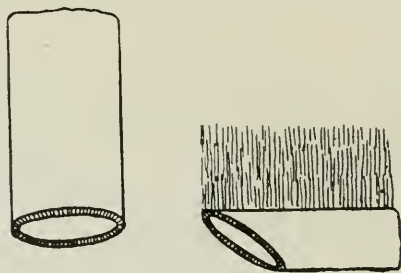


FIG. 13.

ileum; cut off the angles which exist at the junction of this slit and the transversal section of the gut, and then suture the borders of the incision in the ileum with the circumference of the colon.

We do not think that either one of these two latter techniques are to be recommended, and certainly the second is far inferior to the first. In order to adapt the colon to the ileum,

prepared by either one of these procedures, it is necessary to cause the small intestine to present a torsion on its axis, or a torsion around the axis of the colon to the extent of half a circle. Now, in point of fact, either of these movements is impossible without running the risk of having an intestinal obstruction by torsion.

Exclusion of the carcinomatous cæcum by ileosigmoidostomy might be indicated in certain inoperable cases, as has been recently suggested by Giordano.

Having considered the question of symptomatology, diagnosis, and operative technique applicable to cases of carcinoma of the cæcum, we would now record with some detail the cases which have been under our observation, and following this we will briefly give a *résumé* of all cases reported in medical literature that we have been able to find, and will classify them according to the nature of the operative technique employed.

Report of Dr. Cumston's Case.—The following notes of this case were kindly given to me by the patient's physician, Dr. Frederic Coggeshall, of Boston, with whom I saw this case. About the 1st of March, 1900, the doctor was called to see Mrs. C. F., aged forty-one years. The family history was excellent, both grandfathers and grandmothers died of old age. Father and mother still living and in good health. All her brothers and sisters are living and well.

The patient's previous history presented but few points of interest. She had never had any serious illness excepting the diseases of childhood. About seven years ago, shortly after her marriage, she aborted at two months, and on account of a mild sepsis she was dilated and curetted. After this she made a good recovery, and remained in good health for about a year, when she fell from her bicycle in such a way that the handle of her machine was driven against her abdomen with considerable force, the brunt of the blow being received in the region of the appendix. This caused considerable soreness for several days.

The patient had always been inclined to constipation, and early in the winter she began to notice that her abdomen "felt tired" if she sat too long in a straight chair, especially if it were

too high to allow good support for her feet. Throughout the winter she was also troubled at times with flatulence.

She had not lost flesh, but the doctor had noticed, as he met her casually during the previous three or four months, that she looked pale, and as if she were tired and overworked, although this was not the case. She was a well-developed, well-nourished woman, somewhat under middle size, and had always had a rather neurotic temperament.

At the time of the doctor's first visit the patient was in bed, with her knees drawn up; had an anxious expression; pulse of 120, of fair quality; and a temperature of 38° C. The evening before she had partaken of lobster salad, and had been in pain all night. The pain was not relieved by repeated doses of a cholera mixture containing some opium. The bowels had moved the day before. The abdomen was slightly tympanitic, excepting over the right iliac fossa. There was general tenderness with exquisite sensitiveness in the region of the appendix. She could not relax herself sufficiently to allow of satisfactory palpation, but the doctor thought that there was no mass or resistance to be made out.

The patient completely recovered in two days from this attack, and was not seen again by her physician for two months. From time to time, when he met her, she would complain of considerable flatulency and some tendency to diarrhoea, and afterwards told him that during this time she had had two milder attacks of the same character as the one already described.

In the early part of May the doctor saw her again in a similar attack, but the pain was more severe and started in the right iliac fossa, radiating towards the umbilicus. By palpation there was some tenderness, but nothing could be felt in the region of McBurney's point excepting the gurgling of gas in the bowels. There was some tympanites. She had vomited several times through the night, the vomitus consisting chiefly of bile and mucus, and had had several dark and offensive watery movements. The temperature was 39° C. and a pulse of 120, of good quality. Recovery again followed in the course of two days. As the patient desired to be operated on, the appendix was removed on May 20. On passing the finger into the abdomen, the first thing it came into contact with was the end of the cæcum, and this was at once drawn out of the incision without difficulty, bringing the appendix along with it. The appendix was about seven cen-

PLATE I.



External aspect of Dr. Cumston's specimen of carcinoma of the cecum.

timetres long, was doubled back on itself, with its extremity adherent to the cæcum just behind its base, but otherwise it had not adhered to the surrounding structures. The appendix was then removed and the cæcum was dropped back into the abdominal cavity, not more than an inch of it having been exposed during the operation.

Examination of the appendix showed that it was somewhat dilated and the mucous membrane was swollen and hyperæmic; its cavity contained a little odorless, brown fluid. There was a small erosion at one point of the mucous membrane near the tip of the organ, at the point where it was adherent to the cæcum.

The patient made an excellent recovery, but she was continually annoyed by flatulence and constipation during her convalescence in bed. When she began to sit up on the tenth day, these symptoms improved. She went out on the fourteenth day feeling very well, but within three or four days she began to be again troubled by attacks of pain, less definitely marked, but similar to those for which she had been operated upon. The flatulence and colic became constantly more and more frequent, and the attack usually ended in the vomiting of bile, mucus, and undigested food, and in one or two dark, watery movements of the bowels. These symptoms were aggravated by being on her feet, but would subside after a day's rest in bed. There was extreme borborygmus. Tenderness over the region of the cæcum was now constant, and pain starting from that point radiated towards the umbilicus.

In the course of the next fortnight, after she began to be about again, she had spent five days in bed. The symptoms then improved for about a week, but returned with increased persistency at the end of that time, and on several occasions morphine was necessary to control the pain. Two points in the abdomen now became the special seats of distention of gas, namely, the region of the cæcum and the sigmoid flexure, both of which could be felt to swell up under the hand and then subside with loud gurgling. The pain was not constant, but occurred spasmodically, and corresponded somewhat to rhythmical dilatations with gas of the portions of the bowels just mentioned. The principal seat of pain had now shifted to the hypogastrium and umbilicus, and the patient was evidently growing weaker and losing flesh.

By palpation, a small, distinct, hard resistance could be made out in the region of the operation for appendicitis which could not

be felt before this operation, and which the doctor at first took to be an inflammatory process arising around the site of the operation. It was very small when first discovered, three weeks after the appendix had been removed, but increased in size and distinctness in the course of the next five weeks. Eight weeks after the operation, Dr. Cumston was asked to see the patient in consultation.

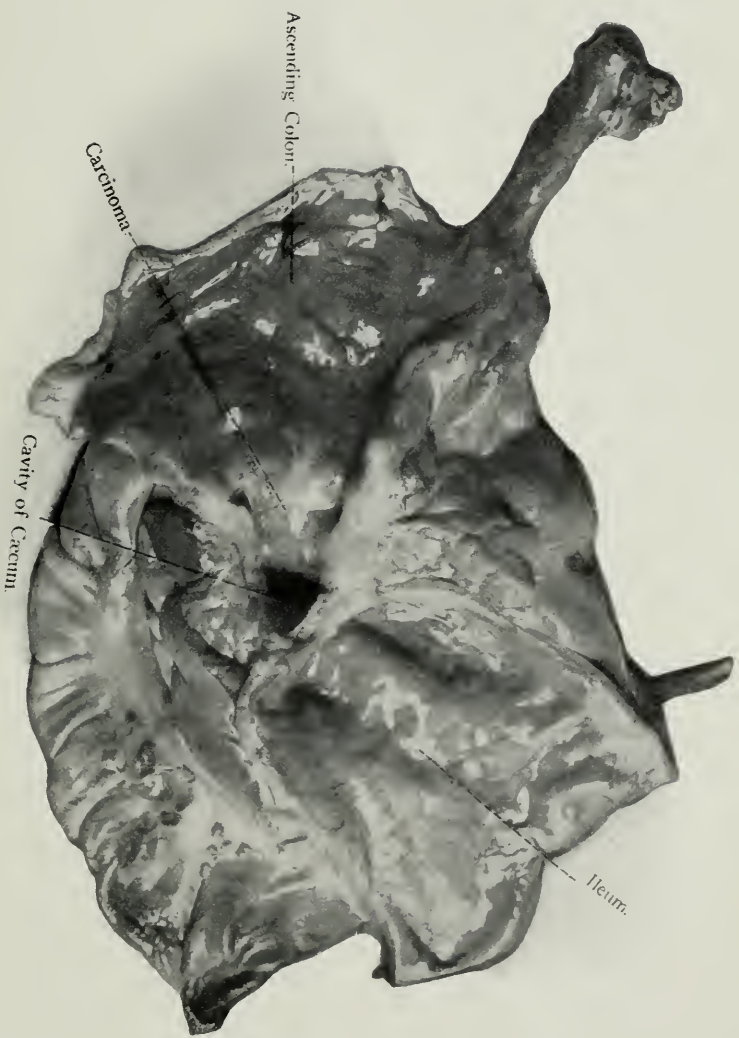
On examination of the abdomen I agreed in all that had previously been found, namely, that by deep palpation of the right iliac fossa a small, hard, immovable mass could be detected apparently situated near the cæcum. The intestines were greatly distended, and by percussion the entire abdomen was found to be tympanitic, and no dulness could be elicited in the right iliac fossa. The patient had vomited on several occasions during the last two or three days, and it was with difficulty that a movement of the bowels could be obtained. The pulse, which was of a fairly good quality, averaged about 100 to the minute, and was regular. The tongue was furred, the eyes had a sunken expression, and the features were drawn.

A diagnosis of intestinal occlusion seated in the neighborhood of the cæcum was made, but the nature of the obstruction was doubtful to my mind; still, on account of the previous operation for appendicitis, it was thought probably due to adhesions constricting the gut, and an operation was advised.

As the patient was desirous of avoiding another operation, Dr. Herman Vickery saw her two days after, when the symptoms were increasing, and agreed that at least an exploratory incision was justifiable on account of the increasing severity of the symptoms. The expression had now assumed a decidedly abdominal type, and the pulse was becoming more rapid and weaker. The abdominal pains and tympanism were increasing, and the patient was decidedly weaker and looked much worse than two days before when I first saw her.

With some hesitation on the following morning I opened the abdomen in the median line. Great difficulty was experienced in keeping the small intestine out of the way on account of the considerable distention. The cæcum was bound down in the iliac fossa and, by passing the hand towards the ascending colon, a small, hard mass about the size of a large English walnut was detected. A small transversal incision, perpendicular to the me-

PLATE II.



Internal aspect of Dr. Cumston's specimen of carcinoma of the cecum.

dian one, was then made in order to have more working space, and, after a long and difficult dissection with the fingers, the cæcum with its neoplasm was mobilized and brought up into the abdominal incision.

The growth was found to be an annular carcinoma situated at the junction of the cæcum with the ascending colon. To all appearances the lymphatic glands in the mesentery had not become secondarily invaded by the malignant process. At this point of the operation the patient showed such a marked state of collapse that the time necessary to perform resection of the cæcum and intestinal anastomosis could not be spared; and it was decided to make an artificial anus in the cæcum, with the hope that the patient might rally sufficiently to undergo complete resection of the diseased intestine in a few days. An artificial anus was made in the median line according to the technique advocated by Mr. Cripps. The gut was not opened at the operation because it was thought better to allow twenty-four hours to intervene before this was done, so that the borders of the wound might become walled off by adhesions, which are rapidly thrown off in a very few hours and render peritoneal infection less likely, and a more perfect result as to the functions of the artificial anus.

The patient, however, did not rally, and died twenty hours after the operation. Examination showed that the intestine had become nicely walled off by adhesions, and when the gut was opened, a perfect result was found to have been obtained. The cæcum formed a large pouch, which was filled with fæces, and, had the patient survived, it is probable that the artificial anus in the median line would have worked perfectly. The cæcum with the neoplasm was removed, and the two photographs here annexed will better illustrate the condition than words.

Report of Dr. Vanderveer's Case.—Miss A. S., aged twenty-one years, housewife by occupation. By correspondence, the case was referred to me by Dr. J. Seward White, of Glens Falls, New York, the doctor bringing the case to the Albany Hospital a little later on, December 10, 1899. On examination she presented a very emaciated appearance, but lungs, heart, and such organs as the liver and spleen, apparently in healthy condition. A rather normal quantity of urine was secreted, of an amber color, specific gravity 1012, acid, no sugar nor albumen, and microscopical examination negative. Abdomen was somewhat flattened, but very

resisting. Patient had an exceedingly anxious expression of face, rather dull in her mental condition, very much concerned regarding an operation, and doubtful as to her recovery. Temperature, 99.4° F.; pulse, 92. Slept a great deal of the time. During the summer of 1899 the patient had had somewhat frequent attacks of nausea and vomiting, with no apparent cause. Her bowels at such times would be constipated, and each time she would have greater difficulty in getting them to move. Since November 1 she has been greatly troubled with persistent constipation and pain. Had been given calomel, various laxatives and high enemas, but her bowel movements had grown steadily less, and since December 1 no fæcal movement at all had been obtained, although high enemas of castor-oil and glycerin were frequently used. She suffered pain of such a character as to require hypodermics of morphia. Since December 1 patient had passed no flatus from the bowel, but had great eructation of gas, and at times considerable vomiting. She was unable to take nourishment, and, although very persistent in taking liquids, could not retain them.

Past History.—When nine years of age she swallowed a bullet, probably the size of a 39 calibre. This was never found in her stools, and she was not known to have passed it.

Family history negative, although on her mother's side there was a suspicion of tuberculosis.

On physical examination it was impossible to make out a distinct tumor, the resistance of the abdominal wall being such as to cause great distress. She had all the symptoms of complete obstruction low down that are usually presented in such cases. It was evident her difficulty was in the right inguinal region, and I believed we had to deal with a case of appendicitis, in which there was obstruction due to a long appendix, involving the intestine, or possibly there were adhesive bands. There was apparently but one line of treatment possible, and that was an exploratory incision, believing we would find the trouble connected with or about the appendix. To this her family physician and friends readily consented, but the patient did not give us any great encouragement; in fact, she did not seem to realize the seriousness of her condition. She was carefully prepared, and at 10.30 A.M., December 11, 1899, I made an exploration through the right linea semilunaris and reached the head of the cæcum, together with a very long appendix. The latter was distended to the size of my

finger. I first removed the appendix, and then looked for bands of adhesions to account for the obstruction of the lower end of the cæcum. On farther examination I came in contact with a hard, stricture-like tissue that encircled the greater portion of the cæcum. By careful manipulation I loosened it from the connective-tissue attachments, and brought it up into the wound, when I found I had to deal with a case of carcinoma of the cæcum. The mesenteric glands were apparently free from infection. I removed the growth and did a resection of the intestine, also removed the head of the cæcum, and brought together the distal end of the cæcum, which was not much distended, with the lower end of the ileum, which was so distended that we made use of the full-sized Murphy button. The entire operation occupied an hour and fifteen minutes. The patient on leaving the operating table had a pulse of 88, but at 3 P.M. it had gone up to 120, and she remained in an unconscious state. Hypodermics of one-thirtieth grain of strychnia were given every three or four hours, and enemas of normal salt solution and whiskey every four hours, but the pulse increased in beat and was more feeble. At midnight the temperature was 98° F.; pulse, 122. The patient had become conscious, would doze at intervals, and complained of pain in her abdomen. Secretion of urine at 4 P.M. was eight ounces, at 9 P.M., nine ounces, and at 3.30 A.M., seven ounces. At the latter hour her pulse was in the neighborhood of 160 and very weak, but finally came down to 146, the patient feeling more comfortable, yet still complained of pain in abdomen. December 13, at 7.30 A.M., her temperature was 101.2° F.; pulse, 170, and difficult to count accurately. I feared we had some internal hæmorrhage to deal with. Saline transfusion was made use of to the amount of a pint, and at 12 M. temperature was 98.8° F., pulse, 120; no vomiting. At this time she retained some liquid peptonoids, and the secretion of urine had continued favorable. At 2.30 P.M. her pulse was 150, but she strongly complained of pain in right side of abdomen. Enemas were kept up, and at 6 P.M. her pulse was 166. She dozed most of the day, sleeping quite a good deal. At 8.30 P.M. infusion was repeated. At twelve o'clock, midnight, temperature was 98.6° F.; pulse, 156. She had not been sleeping much since 6 P.M. She retained liquid peptonoids per stomach, and secretion of urine at 12 M., seven ounces, at 3.30 A.M., the 14th, four ounces. During this time the patient had

complained of severe pain in back and abdomen, the pulse ranging from 148 to 156, yet she slept for a period of three hours. At 6 A.M. she was comfortable, sleeping most of the time. Hypodermics of strychnia and digitalis, also enemas of whiskey and normal salt solution, repeated. At 6.30 A.M. pulse was 160; 8 A.M. liquid peptonoids retained by the stomach, six ounces of urine passed, temperature 102° F.; pulse, 172. 10.30 A.M. patient took of Matzoon, and slept quite comfortably, also during the afternoon took of liquid peptonoids and egg albumen. At 4 P.M. hypodermic of nitroglycerin, also brandy given, and pulse was 176, temperature 101° F. 4.30 to 8 P.M. hypodermics and general line of treatment continued. During this time she had passed seven ounces of urine; there was some abdominal distention, and pulse ranged up to about 170. At 9 P.M. she passed eight ounces of urine; at twelve, midnight, temperature 98.6° F., pulse 176, patient taking and retaining peptonoids as well as could be desired. At 3 A.M., December 15, had slept for nearly three hours. Pulse rate difficult to count and respirations more rapid. Being somewhat restless, she was given one-sixth grain of morphine. Extremities cold, and hot water applied. Patient failed gradually, pulse was imperceptible, and she died at 6.30 A.M., December 15.

Autopsy.—No evidence of hæmorrhage; good union of peritoneal surface of the intestine at the point of anastomosis. While there was no rupture, yet near the mesenteric attachment of the ileum there was a dark spot which would have perforated, beyond a doubt, in the passing of the button. There was no evidence of peritonitis, and cultures made from the peritoneal cavity did not reveal any evidence of sepsis. Cause of death not clearly determined. It is possible this may have been a case of auto-infection. The appearance of the wound was favorable in every respect. Immediate primary union had taken place. I am not altogether sure that the use of the Murphy button was the better way of making the anastomosis in this case. If I were to do the operation over again, I would certainly close the cæcum and do a lateral anastomosis to the ileum. I believe the strain of the button was too great upon the small intestine.

(TO BE CONTINUED.)

ELBOW FRACTURES IN CHILDREN.

FRACTURES OF THE LOWER END OF THE HUMERUS; LESIONS
AND END RESULTS, AND THEIR BEARING
UPON TREATMENT.

By FREDERIC J. COTTON, M.D.,

OF BOSTON, MASS.

IN children these fractures are common, and present themselves as the result of comparatively slight force; in adults they are relatively infrequent, and usually result, when they do occur, from much severer accidents; for these reasons, and more especially because of the different anatomical conditions in the child and in the adult, it has seemed best in this paper to deal only with those cases occurring in children.

Only such cases, then, will be considered as present fractures of the lower end of the humerus occurring before the age of fifteen. This is the natural division and comprises a vast majority of elbow injuries as seen in hospital clinics and elsewhere.

These injuries are very common; they result from relatively slight falls; they are not easily diagnosed as regards the detailed lesions; diagnostic errors, or more often vagueness in diagnosis, are common enough; the treatment, varying from time to time, and varying in the hands of different surgeons, has not been differentiated to any extent according to the different forms of lesion found or suspected; poor and imperfect results are so common that they are almost universally feared, if not expected, from the start. The prognosis therefore is usually given vaguely, often with a view to a worse result than seems to be borne out by the condition of old cases as they turn up years later. The warning is always given as to the large

possibility of a poor result, but without any clear notions as to the conditions that justify the expectation of a poor or of a good result in a given case.

In view of these facts, it would seem worth while

(1) To examine as well as may be the lesions occurring, and to see how far the usual conceptions and classifications agree with the facts.

(2) To find out whether the varying end results have any discoverable relation to the varieties of lesions.

(3) To discover whether imperfect results have any assignable, perhaps preventable, cause apart from the character of the lesion.

(4) To consider the advisability of modifying treatment according to the particular lesion present and the particular ill result to be anticipated or feared.

The investigation on which this paper is based was first taken up owing to the writer's growing belief that the ordinarily accepted descriptions and classifications of elbow fractures in children were somewhat inadequate, and to the feeling that the resources of the skiagraph in determining exact lesions had been neglected in this class of injuries.¹

The further extension of the inquiry to the questions of prognosis and treatment was an outgrowth of the original inquiry as to lesions and diagnosis,—a search for some differentiation of end results corresponding to and as definite as the differentiation found in the original lesions.

The material to start with was a series of hospital cases,² something over twenty in number, in children, apparently differing in no way from the usual run of such cases seen in clinics. The X-ray examination was utilized in nearly all these cases to confirm or modify the findings of the ether examination, and in some cases repeated skiagraphs were taken from time to time during the treatment. The course of treatment and repair was

¹ Since this time there have been published one large and several small series of X-ray plates of elbows, to be referred to later.

² Treated at the Boston City Hospital while the writer was acting as out-patient surgeon.

carefully noted, and the condition of the arm, as to deformity, limitation of motion, etc., was recorded at the time of discontinuing treatment.

Other like cases treated and seen by the writer before and since,¹ of which adequate data were at hand, have been added to the series, and a very few cases as well which were not seen for some time after the original injury. In this last class of cases the earlier clinical history was looked up as far as it was recorded in hospital records, etc.

It was obvious that the end results noted at the time of discontinuing treatment were not to be relied on as showing the final outcome of the cases. Accordingly, after about a year had elapsed from the time the first series had been treated, an attempt was made to find and examine the patients. This attempt was rather more than usually successful, and accordingly the writer is able to present actual end results recorded by tracings, photographs, and measurements of range of motion in a considerable number of the cases studied at the time of injury.

Pathological and experimental data and records of such series and of such isolated cases as are reported in available form in the literature have been utilized for comparison. Carefully reported clinical series are, however, few, and unless accompanied by skiagraphs they are not usually precise enough to be available. The pathological data prove to be rather scanty. There are many specimens of elbow fractures in adults in the museums, but very few indeed of like fractures in children. The collections of the Warren Museum in Boston, the Mütter Museum in Philadelphia, and the New York Hospital Museum in New York have been looked over, but practically without result. In all, the writer has seen but three specimens from elbow fractures in children, and the specimens described in the literature (mainly from the London collections) are but few in number. A number of anatomical examinations have, however, been made possible by operation for faulty results,

¹ At the Children's Hospital, etc.

etc., and these, especially when carried out for non-union, or for any other reasons than deformity after union, give available data. Experimental data are not lacking.¹ These data, notoriously untrustworthy in any case, are here of especially little value, because they have largely been carried out on the cadaver of the adult and not that of the child. The writer himself has carried out a few experiments on the cadavera of children for the purpose of confirming clinical data and for the study of displacements.

ANATOMY.

Before considering the question of lesions, a brief consideration of the structure of the lower end of the humerus in the child, anatomically, and as it appears in the skiagraph, is a necessity if we are to understand the abnormal conditions. It is, in fact, this special anatomy of the child's elbow which renders possible and necessary the consideration of children's elbow fractures as a special class.

At birth, one epiphysis without any points of ossification forms the whole lower end of the humerus, including the epitrochlea (or internal epicondyle) on the inner side, the external condyle and epicondyle on the outer side, and, according to Krause, about one-quarter of the coronoid and olecranon fossæ. The epiphysis is but slightly hollowed out to fit the end of the diaphysis, and the epiphyseal line is almost exactly transverse.

At the age of one and a half or two years a centre of ossification appears about the centre of the external portion of the cartilaginous epiphysis,—the epiphysis of the capitellum or external condyle. There is as yet no point of ossification corresponding to this on the inner side, but the diaphysis early begins to grow downward on the inner side at the expense of the epiphysis, and it results from this that the epiphyseal line becomes increasingly oblique downward and inward, while the cartilage of the trochlear surface becomes thinner and thinner

¹ Senftleben, Helferich, Kocher, Hutchinson, Smith, Moore, Poland, Mouchet, Madelung, Berthomier, Curtillot, Stimson, and others have experimented along this line.

till it is eventually little more than a convex shell capping this portion of the diaphysis. The capitellar epiphysis meanwhile maintains its depth, and ossification proceeds in it from the centre outward in all directions.

Meanwhile at about five years of age the centre of ossification for the epitrochlear epiphysis makes its appearance; occasionally this is not obvious (according to Hutchinson) till ten years or later.

The small, thin ossification centre of the trochlear portion does not appear until the eleventh or twelfth year; at this time the trochlear surface has become little more than a shell, and the ossification at this point never reaches any considerable proportions. According to Faraboeuf this epiphysis unites with the diaphysis direct, but the usual account is that it first fuses with the capitellar epiphysis at about the fifteenth year.

The ossification centre for the external epicondyle appears between twelve and fourteen, is never much more than a small scale, and by the sixteenth year has become merged into the capitellar epiphysis, and soon after this the union of the capitellar epiphysis to the shaft leaves only the epitrochlea as a separate epiphysis. This seems usually to join the diaphysis between the sixteenth and eighteenth year, but may in rare instances, according to Rambaud and Renault,¹ remain an epiphysis throughout life.

The accompanying figures show the conditions at different ages. At the age when lesions are most frequent, from three to twelve years, the end of the diaphysis presents a considerable slope down and inward, and is capped with a thick capitellar epiphysis and a very much thinner trochlear epiphysis;¹ between these two runs a line of demarcation, the capitellar epiphysis including the outer edge of the groove in which the ulna lies as well as the surface for the radial head. (Figs. 1 and 2.)

The internal epicondyle has a separate point of ossification: by twelve years of age it has ceased to be a part of the

¹ At nine years De Paoli gives the thickness of the capitellar epiphysis at twelve millimetres, of the trochlear at only six millimetres.

general epiphyseal cap of the bone; previous to this it is still connected to the trochlea by cartilage, and a fracture of it is much more likely to open the elbow-joint.

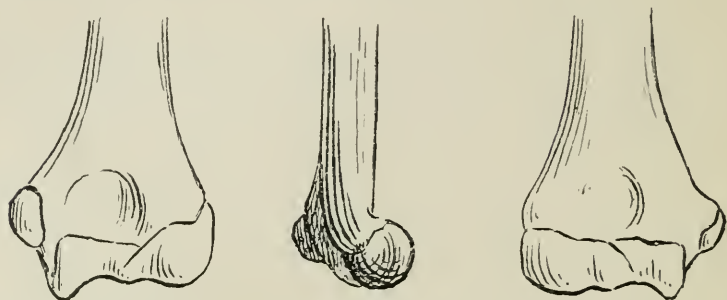


FIG. 1.—Normal epiphyses at eight years. Specimen in the Warren Museum.

As to the appearance of the epiphyses in the skiagraph, the accompanying Figures (3 and 4) give an adequate idea. It is to be noted

(1) That the capitellar epiphysis is, in the lateral view, projected against the lower inner end of the diaphysis, and that it lies well forward of the axis of the shaft.

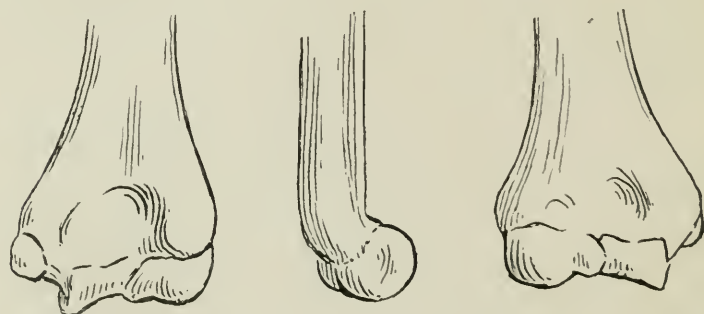


FIG. 2.—Normal epiphyses at ten years. Specimen in the Warren Museum.

(2) That there is *normally* a marked apparent gap in the space actually filled by the articular cartilage of trochlea and ulna. (Fig. 4, B.)

(3) That the trochlear epiphysis is not always apparent,



FIG. 3.—Anteroposterior view. Epiphyses at about thirteen years. A, Capitellar epiphysis; D, Trochlear epiphysis; C, Epitrochlear epiphysis; G, Radial epiphysis.



FIG. 4.—Anteroposterior view at ten and one-half years. A, Capitellar epiphysis; B, Space occupied by trochlear cartilage; C, Epitrochlear epiphysis; D, Epiphysis of radial head.

even when we might expect ossification to be present in it, and is, in fact, rarely seen.¹

(4) That the centre of ossification of the epitrochlea is thin and may not show in the anteroposterior view.

(5) That this same epiphysis may show in the lateral view and give rise to confusion, if unsuspected.

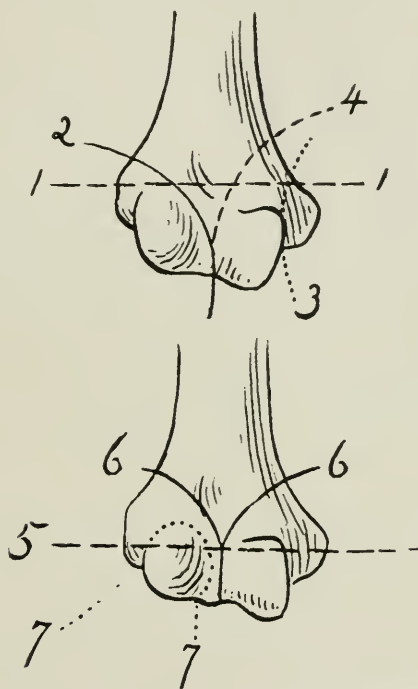


FIG. 5.—Fracture lines (after Kocher).

(6) That the ossification centre of the epiphysis of the external epicondyle is so small and so inconstant that it may practically be disregarded.²

¹ Corson (*ANNALS OF SURGERY*, 1900, p. 624) gives an excellent plate showing this epiphysis unusually well.

² The theory of the ossification of this and other epiphyses of the elbow brought forward by Wolff (O. Wolff, *Deutsche Zeitschrift für Chirurgie*, 1900, liv, 290), and illustrated by schematic drawings from X-rays, differs in so many points from that held by others that it can hardly be considered or explained.

CLASSIFICATION.

It is inevitable that in the child's elbow, constructed, as we have seen, of a complicated series of epiphyses, the epiphyseal lines should in part at least determine the site and course of the fracture. This is what actually happens, and we shall see that a very large proportion of the injuries, though they may often involve the diaphysis to a slight extent, are really essentially epiphyseal separations. This is true not only of the separation of the lower epiphysis as a whole, but more especially in relation to the separate epiphyses of the external condyle and of the internal epicondyle.

It is somewhat striking that the epiphyseal character of these injuries should so persistently fail of recognition. Here and there it is recognized, but in the text-books at least the good old classification is adhered to, and fractures of adults and of children are treated as if identical in character. The typical arrangement with which every one is familiar is the division into fractures of the internal condyle, of the internal epicondyle (or fractures of the internal condyle "involving or not involving the joint"), fractures of the external condyle, of the external epicondyle, supracondylar fractures, and T or V fractures. This classification on the face of it suggests respect for geometric completeness rather than clinical facts, and the only concession to actual case-findings is in the description usually appended of "separation of the lower epiphysis of the humerus," *i.e.*, separation of the whole epiphyseal cap.

A similar but more accurate classification is that of Kocher indicated in Fig. 5. This scheme recognizes that the epiphyseal lines play a part; and though it includes several fracture lines which hardly occur in children, yet it is fairly satisfactory, and, to avoid the undesirable alternative of constructing an entirely new classification, substantially this scheme will be used in the presentation of cases and the discussion of types which follows. These are arranged, then, in this way.

Fracture or epiphyseal separation of the external condyle. (Fig. 5, 2.) Separation of the whole epiphysis (Fig. 5, 5); (a) pure; (b) involving part of diaphysis at one side. Supra-

condylar fractures. (Fig. 5, 1.) T or Y fractures. (Fig. 5, 6.) Epiphyseal separation of the epitrochlea. (Fig. 5, 3.) Fracture of the internal condyle. (Fig. 5, 4.) Partial fracture of the capitellum. (Fig. 5, 7.) Fracture of the external epicondyle.

The last three of these are so rare, at least in children, that they may be practically disregarded; the same is apparently true of T and Y fractures in children. Moreover, the separation of the whole epiphysis, the condylar and supracondylar fractures, belong mechanically to the same class, and are clinically very hard to diagnose one from the other without the help of the X-ray, so that although a more elaborate classification is necessary for description, yet it is to be stated here, and not to be lost sight of, that the classification practically possible when a case is examined, the classification of importance in course and treatment, resolves itself into (*a*) Fractures of the external condyle; (*b*) Supracondylar and condylar fractures, including separation of the epiphysis as a whole. (*c*) Fractures of the internal epicondyle.

FRACTURES OF THE EXTERNAL CONDYLE.

These as here classified represent a class of substantially epiphyseal lesions, a separation of the capitellar epiphysis (usually with its trochlear prolongation, Figs. 1 and 2), and in the great majority of cases including a sliver of diaphysis.

The writer's series shows sixteen of this class of cases.

The skiagraphs accompanying the following case records are the ordinary hospital X-rays taken for diagnosis, not to confirm reposition, and without any certainty of a constant relation of tube, arm, and plate; in some, therefore, there is a considerable distortion. The tracings are photographic reductions of the actual tracings taken in the late examinations of the patients. The original tracings were taken with a pencil, and show the thickening of the joints and the thinning opposite soft parts inevitable in such tracings, but were careful, and may be accepted as accurate. The arrangement of tracings in each case is on a uniform plan, in the order detailed in Fig. 8 for tracings of Case I.

CASE I.—J. Q., aged nine years. Separation of the external condyle as an epiphysis. Ether; acute flexion maintained by a

Lund swathe. Skiagraph shows separation of the external condyle (the capitellar epiphysis with a small chip of the diaphysis) with rotation outward.

Three days. Considerable effusion into the joint.

Twelve days. Extension possible to a right angle. Pro- and supination free.

Twenty-seven days. Extension 40° beyond a right angle, supination normal, pronation one-half normal; a heavy callus externally. Position apparently perfect. Position of acute flexion changed to a right angle; internal angular splint.

Thirty-three days. Flexion 20° from a right angle, extension to 45° ; pro- and supination nearly normal. Callus on the outer side only.

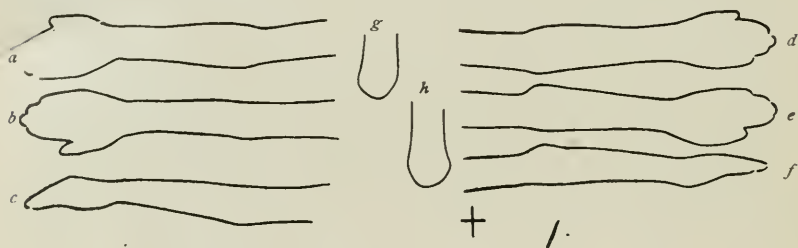


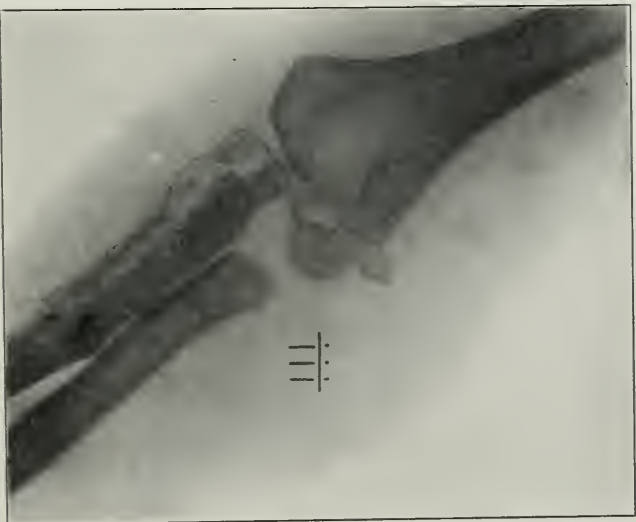
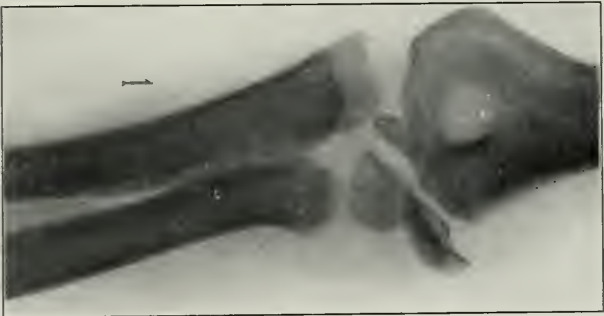
FIG. 8 (Tracings).—Right arm: *a*, In supination; *b*, in pronation; *c*, with ulnar side of hand down (on paper); *g*, upper arm laid on the table, elbow in full flexion. Left arm: *d*, In supination; *e*, in pronation; *f*, ulnar side down; *h*, upper arm, elbow flexed. In each of these sets the injured side is marked with a cross.

Forty-one days. Motion as before. Splint omitted; sling, massage, and passive motion.

Three months. Flexion normal, extension four-fifths the normal range, pro- and supination normal. He is to stretch the arm by carrying weights.

Four and a half months. Flexion normal, extension as before, pro- and supination normal. Limitation of motion dependent on excessive thickening about the external condyle, apparently; there seems to be no displacement. The arm nearly normal as to use.

Five months. Extension still about 30° short. Other motions normal. No deformity except for excessive bone formation above the external condyle. A fresh skiagraph taken shows the



Figs. 6 and 7.—Skiagraphs of Case I. Fig. 6, at time of accident. Fig. 7, five months later.

FIG. 10.—Skiagraph of Case III.

same relation of parts as did the first but apparent growth of the small fragment of diaphysis which lies on the outer side.

Seven months. Motion the same, the bony "spur" the same.

Re-examined at fifteen months.—Function perfect, flexion normal, extension now very slightly limited, but his mother says it has been a good deal limited until within a few weeks; pro- and supination are normal. There is now a rounded, smooth, firm, immovable mass of some size (see tracings) above the external condyle; it is distinctly larger than on his discharge from the hospital. There is no displacement of the bony landmarks and no deviation in the axis of arm and forearm.

CASE II.—A. M., boy of three years. Fell off a couch. Fracture of external condyle of left humerus. Ether. Reduction. Put up at a right angle.

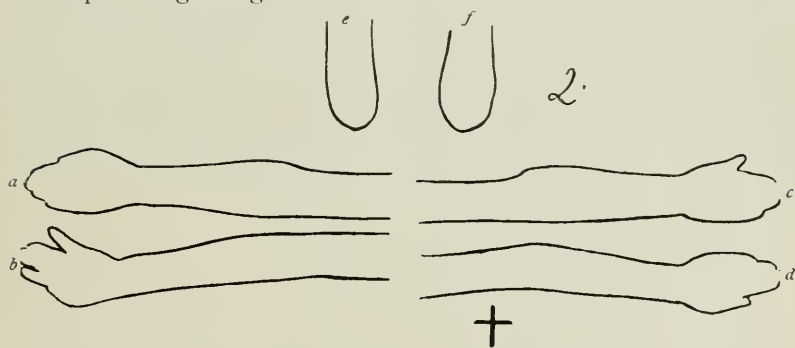


FIG. 9.—Tracings of Case II (at thirteen months). Right arm: *a*, Supinated; *b*, pronated; *c*, elbow flexed. Left arm: *c*, Supinated; *d*, pronated; *f*, elbow flexed.

Four days. Splint retained. X-ray shows a fracture at the outer side, including the epiphysis of the capitellum and a small fragment of the diaphysis just above it; some outward and downward rotation of fragment, but position good.

Nineteen days. Union seems to be solid. Some thickening about the external condyle. Position good. Flexion to 10° , extension two-thirds the normal. Supination and pronation of half the normal range.

Thirty days. Flexion one-half normal, extension one-half, pronation decidedly limited. Supination normal. Splint omitted. Massage.

Thirty-five days. Motion as before.

Forty-two days. No increase in motion.

Did not reappear at the clinic.

Re-examined thirteen months later.—Function perfect.

Flexion, pronation and supination normal, extension beyond straight line, but less hyperextension than on the other side. Some thickening just above the external condyle, a flat ridge running from before backward; no spur. Axis of arm and forearm the same (*i.e.*, straight line), but this also is the case with the sound elbow.

CASE III.—J. B., aged four years. Fell from a trunk. Next day, under ether, a separation of the external condyle was made out with bony crepitus. There was *no* lateral mobility of the ulna at the elbow. Motions free after reduction, without displacement of fragments. Put up in acute flexion. Lund swathe.

Two days. Swelling moderate.

Four days. Swelling increased.

Fourteen days. Position good.

Twenty-six days. Acute flexion changed to a right angle.

Thirty-one days. Position excellent. 45° of motion.

Did not continue treatment. X-ray taken during treatment showed a separation of the capitellar epiphysis; the epiphysis rotated outward, carrying with it a small chip of the diaphysis.

Re-examined one year later.—Mother says that free motion returned within two weeks of the last visit to the hospital. Motions now entirely normal. No spur above the condyle. No deviation in the axis of the forearm. (Tracing not taken because of fractiousness of the child, but a satisfactory examination was made.)

CASE IV.—E. B., aged seven years. Fell on stairs. Put up in accident room the same day, detailed diagnosis not made. Put up at a right angle on a splint.

Two days. Much ecchymosis, especially on the outer side. Some effusion into the joint. No deformity.

Twenty days. Thickening about the external condyle; good position; flexion 15° , extension to four-fifths the normal range, pro- and supination normal. Union almost firm, but a click in the joint on motion.

Twenty-four days. Massage and gentle passive motion begun.

Twenty-six days. Above the external condyle a sharp pro-



FIG. 12.



FIG. 13.—Case IV (at twelve months).

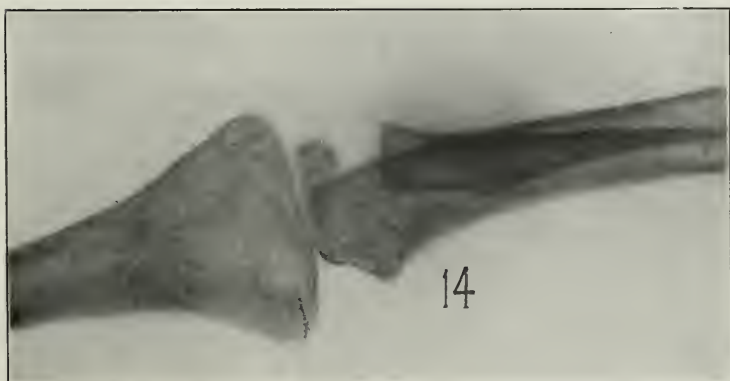


FIG. 21.—Skiagraph of Case XIV.

jection, below which is to be felt the mass of the capitellum on which the radius rotates normally. Flexion one-half normal, extension two-thirds normal, firm union, no deformity.

Forty-eight days. Flexion 20° beyond a right angle, extension one-half normal. Motion painful, and the external condyle proves to be mobile to some extent. Massage and passive motion stopped. Put in splint again.

Fifty days. Skiagraph taken to determine the cause of the spur. The fracture was evidently an epiphyseal separation with a small portion of the diaphysis; the apparent displacement of the condyle is in part due to distortion in the skiagraph, for the condyle is felt to be in place; the spur corresponds to the small mass lying externally, evidently originally belonging to the diaphysis.

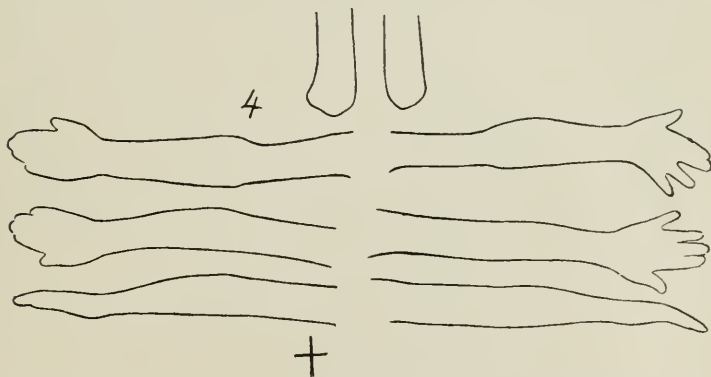


FIG. 11.—Tracings of Case IV (arranged as in previous plates).

Seventy-three days. Union firm, flexion normal, pro- and supination normal, extension can be forced to 80° . Will not use arm as much as she should.

Re-examined at twelve months.—Function perfect; flexion normal, extension slightly limited, perhaps 10° ; pro- and supination normal. Condyle not mobile, but above it a well-marked spur of some size. A very slight increase of the “carrying angle,”—cubitus valgus.

CASE V.—E. McD., boy of eight years. Fell down a short flight of steps, striking on the right elbow. Three hours later examined under ether. Elbow bruised, especially on the *outer* side. Considerable swelling. Joint mechanically intact (under ether) except for the possibility of considerable abnormal *adduc-*

tion. Bony crepitus present; apparently a fracture separating the external condylar epiphysis, and extending up and outward through the diaphysis. Reduced by extension, abduction, lateral pressure, and flexion. Put up at a right angle. Skiagraph to be taken. Skiagraph showed fracture, including a sliver of diaphysis with the external condyle; good position.

Four days. Moderate swelling, no pain.

Eleven days. Swelling rapidly subsiding; position good.

Eighteen days. No deformity. Swelling nearly gone.

Twenty-five days. Condition unchanged.

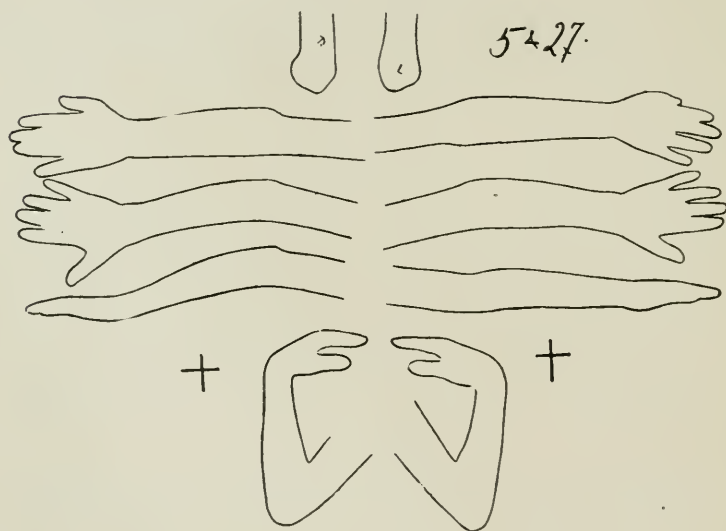


FIG. 14.—Case V (at four months). (Arrangement as usual.)

Right arm, Case V. Left arm, older fracture, Case XXVII.

Lower tracings show maximum flexion.

Thirty-two days. Free motion for 30° . Position excellent. A slight spur now apparent just above external condyle. Position of landmarks normal.

Thirty-nine days. Extension 60° beyond a right angle. Flexion a few degrees beyond a right angle. Splint omitted. Sling.

Forty-six days. Flexion 30° beyond a right angle. Sling.

Re-examined at four months. Function perfect. Flexion very nearly normal. Extension about 15° short of the straight

line (see tracing). Pro- and supination normal. A well marked blunt spur just above the external condyle. The external condyle itself is evidently in normal position. There is no gunstock deformity, though there is no considerable carrying angle. This may be nearly or actually normal for this boy. The other arm having a distinct gunstock deformity (Case XXVII) does not serve for comparison.

CASE VI.—M. McL., aged three years. Fell and produced a

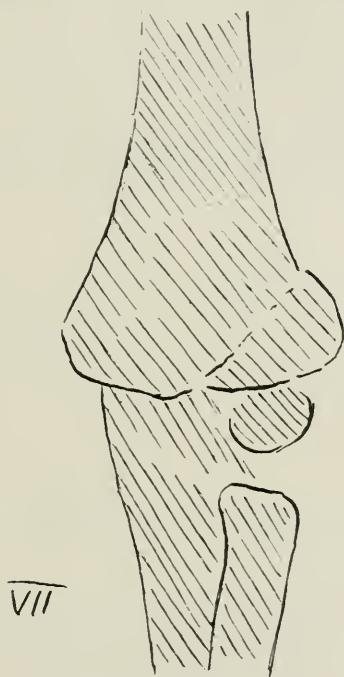


FIG. 15.—Sketch from negative,—poor negative,—but fracture line to be made out.

fracture, which was put up without ether in the accident room. Detailed diagnosis not made. Internal angular splint.

Eight days. Reports without apparatus. Marked deformity—cubitus varus. Recommended to the House. X-ray taken.

Nine days. Skiagraph shows no fracture of the diaphysis; apparently a separation of the capitellar epiphysis. Reduced under ether by Dr. Munro. The external condyle proved to be freely movable; mobility confined to the epiphysis of the external

condyle alone; no bony crepitus. Reduction by extension, then flexion with lateral compression. Put up in acute flexion.

Forty-three days. Swelling gone. External condyle still slightly movable and presents a spur a trifle above the epiphyseal line. Apparent slight displacement of the condyle downward. Acute flexion, sling continued.

Fifty-seven days. Has not reported. Bandage removed at home. Union of condyle with shaft is now solid; the spur now well marked; condyle apparently displaced a little down and forward. Flexion 45° , extension to a right angle and can be forced about 30° beyond; pro- and supination nearly normal.

Eighty-four days. Extension to 45° or 50° beyond a right angle; other motions normal. Union solid. Some thickening about external condyle and a distinct spur as noted. Displacement of condyle, if any, is forward; no deformity to be made out apart

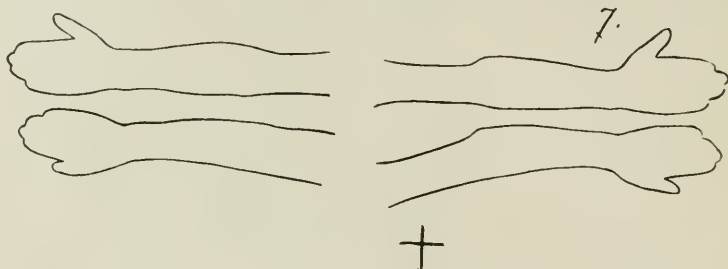


FIG. 16.—Tracings of Case VII (at ten months). Usual arrangement. (The tracing of left pronation does not show fullest possible extension.)

from the spur. Skiagraph taken shows marked bony growth at the site of the spur—evidently in part at least new bone, as it did not show clearly on the skiagraph of two and a half months ago. From its shape it evidently represents a scale of periosteum and perhaps diaphysis.

Ninety-five days. Flexion 45° , extension 45° . The limitation in part due to voluntary resistance. Pro- and supination are normal. Did not report again and could not be traced later.

CASE VII.—F. D., aged four years. Fell from a chair, directly on the elbow. Fracture put up on internal angular splint the same day.

Three days. Skiagraph taken; shows a fracture running from above the external condyle down and in the direction of the outer portion of the trochlea.

Eight days. Considerable thickening about the joint.

Twenty-four days. Flexion 15° , extension 40° , pro- and supination normal.

Thirty-two days. Flexion one-half normal, extension 60° beyond a right angle, rotation normal. Moderate callus, little swelling, sling only. Massage.

Thirty-five days. Flexion to 45° , forced to 70° .

Re-examined at ten months.—Function perfect, flexion normal, extension nearly to straight line, hyperextension lost, pro- and supination normal. No great thickening, but a moderate spur of new bone above the external condyle. A very slight deviation of the forearm in the direction of varus.

CASE VIII.—G. H., aged six years. Fracture of external condyle into the joint. Put up in internal angular splint.

One day. Ecchymosis is over external condyle.

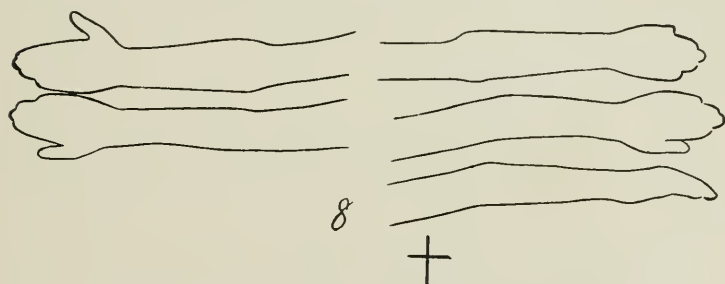


FIG. 17.—Tracings of Case VIII (at eleven months).

Nine days. External condyle apparently displaced down and outward. An attempt made to reduce this deformity and to maintain position with a pad and adhesive straps.

Twelve days. Attempt to diminish the displacement has apparently been successful. Swelling now gone.

Twenty-one days. Flexion of 20° , extension 40° , rotation normal. Good position.

Twenty-six days. Flexion 30° , extension 50° . Massage and passive motion begun; splint retained.

Twenty-eight days. Sling only.

Thirty-five days. Flexion 45° , extension 60° , passive motion continued.

Forty-seven days. Muscular spasm increased, passive motion and massage omitted.

Fifty-four days. No gain in motion.

Seventy-eight days. Flexion 45° , extension 30° , rotation normal. External condyle is unduly prominent and seemingly a little lower than normal. X-ray taken. Skiagraph shows apparently an outward displacement of the capitellar epiphysis. The fracture evidently separated not only this, but a small scale of diaphysis on the outer side.

Re-examined at eleven months.—Function perfect now, but was weak for a long time; muscular development now nearly that of the sound arm. Flexion normal, extension 20° short; pro- and supination normal. A well-marked spur above the external condyle; a question of some outward displacement of the condyle itself. Practically no cubitus varus. (See tracings, Fig. 17.)

CASE IX.—D. McL., aged two years and three months. Fell from chair. First seen after three days. External condyle freely movable. Apparently a separation of this only. Ecchymosis mainly on the inner side of the elbow. Reduced under ether; put up on a splint at right angles.

Seven days. Much swelling, position good.

Twelve days. Union apparently firm. Flexion to 20° , extension to normal limit. Pro- and supination normal. Splint reapplied.

Sixteen days. Union not quite firm.

Nineteen days. Still slight mobility.

Twenty-nine days. Firm union; flexion two-thirds the normal range. Extension two-thirds normal. Pro- and supination normal. Splint omitted. Bandage, sling, massage, and passive motion.

Forty-one days. Flexion to 45° , extension 60° beyond the right angle. Pro- and supination normal. A click in the joint, but union seems firm; very little callus.

Forty-five days. Flexion nearly normal. Extension of 70° ; pro- and supination normal. The click persists. Little or no deformity.

Forty-seven days. Extension nearly normal.

Re-examined twelve months later.—Function perfect; extension exactly normal, flexion limited 10° ; pro- and supination normal. A little thickening about the external condyle and just above it. No displacement of condyles, *no* deviation in axis of arm and forearm.

CASE X.—P. B., aged five and one-half years. Fell down stairs. The next day examined under ether. Distinct fracture of the external condyle; no other injury made out. Put up in a splint at a right angle. No skiagraph.

Four days. Swelling and ecchymosis considerable.

Nine days. Union not yet firm.

Twenty-two days. Solid union; excellent position. Thickening about external condyle. Flexion to 10° , extension 35° beyond a right angle. Splint continued, massage and passive motion begun.

Twenty-five days. Passive motion more painful, to be omitted. Splint continued.

Thirty-six days. Flexion to 30° , extension 50° , less muscular spasm, massage and passive motion resumed.

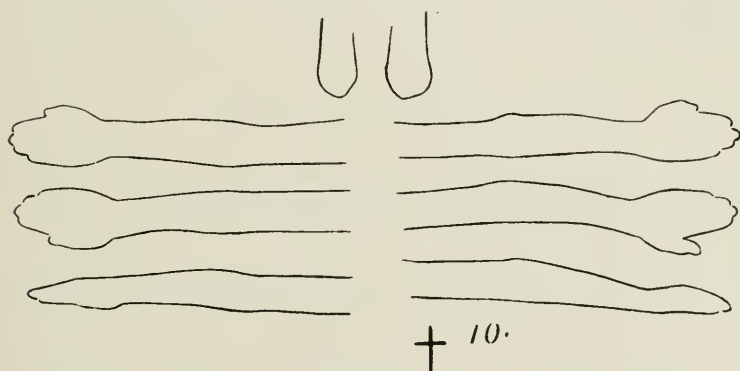


FIG. 18.—Tracings of Case X (at twelve months). In usual arrangement.

Forty-five days. Flexion 30° , extension 50° , checked by spasm of biceps. No deformity obvious. Apparatus omitted.

Sixty-eight days. Extension still 15° short of the straight line. Function already perfectly good.

Three months. Still 10° limitation of extension; flexion, pro- and supination normal. Practically perfect result. Discharged.

Re-examined at twelve months.—Function perfect; flexion normal, extension about 5° short of normal, pro- and supination normal. Still some atrophy. A marked spur just above external condyle. (See tracing, Fig. 18.) Very slight deviation in axis of arm and forearm.

CASE XI.—W. L., boy of three years. Treated according to the records of the Children's Hospital as a fracture of the external condyle of the right humerus. Discharged well after eighty-three days. No skiagraph recorded. Seen three years later. It is now hard to say which arm was fractured. All motions are normal; there is no callus and no spur. Tracings taken. (Fig. 19.)

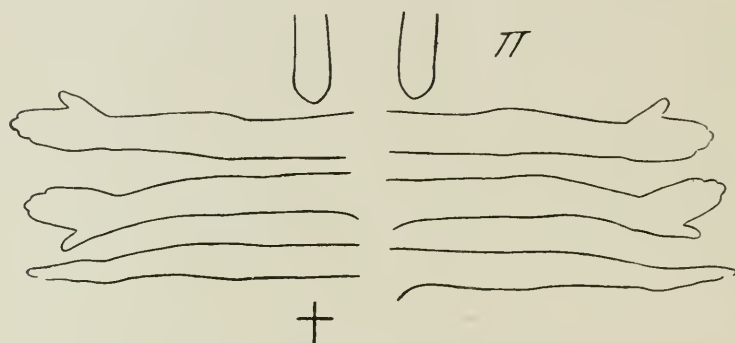


FIG. 19.—Case XI (after three years).

CASE XII.—J. B., aged seven years. Fracture of the external condyle of the left humerus. Put up in acute flexion.

Three days. Swelling less; position good, acute flexion continued.

Eight days. Considerable thickening of the external condylar region.

Nineteen days. Extension possible to a right angle, flexion, pro- and supination normal. Lund swathe omitted, simple sling.

Twenty-six days. Flexion normal, extension slightly beyond a right angle, pro- and supination normal. Excellent position.

Thirty days. Slightly better extension.

Thirty-six days. Flexion good; extension beyond a right angle. Massage and passive motion begun.

Massage and passive motion continued for about five months from the date of the fracture. At eight months there were still 20° limitation of extension.

Re-examined at eighteen months.—Function perfect, flexion normal, extension still stops nearly 30° from the straight line, pro- and supination normal. Thickening about the external condyle, but no spur. Slight gunstock deformity.

CASE XIII.—J. B., aged eight years. (Same patient as last

case; the other arm, broken five months later.) Fell off the stairs; fracture of the external condyle of the right humerus. Ether; put up at a right angle next day after the injury.

Three days. Much ecchymosis and thickening about the external condyle.

Thirteen days. External condyle still mobile.

Twenty days. Firm union; good position; flexion 15° , extension 15° , supination normal, pronation two-thirds normal.

Twenty-four days. Good position. A click in the joint on motion. Splint continued.

Twenty-nine days. Flexion 10° beyond a right angle, extension one-third normal, pro- and supination normal. No abnormal mobility. Much thickening. Massage.

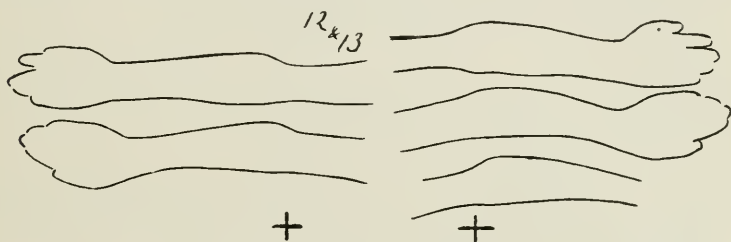


FIG. 20.—Right humerus is Case XIII. Left humerus is Case XII.

Fifty-nine days. Flexion 30° , extension 45° , pro- and supination normal; the thickening persists. No deformity.

Sixty-four days. Flexion 40° , extension 50° , pro- and supination normal.

Eighty-eight days. Flexion nearly normal; extension still $20\text{--}25^\circ$ short of a straight line. External condyle apparently slightly displaced forward; a ridge above and behind it; position of landmarks seems normal.

Re-examined at thirteen months. (Fig. 20.) Function perfect. No limitation of motion. Thickening about the external condyle but no spur formation. No deviation of the axis of the forearm. (Other arm gives no basis for ascertaining the patient's individual normal axis.)

CASE XIV.—N. C., aged nine years. Fall, fracture of elbow. Ether; mobility of capitellum with some crepitus and slight deformity; reduced; put up in acute flexion.

Three days. Considerable joint effusion.

Six days. Position good.

Ten days. Acute angle changed to a right angle. Put on a splint.

Twenty-two days. Flexion 15° , extension to 45° ; pro- and supination normal. Child removed splint at home. Sling and bandage.

Thirty-seven days. Reports again with arm out of apparatus. Condition about the same. Did not reappear and could not be traced later. The X-ray taken during treatment showed fracture of the external condyle (with a portion of the diaphysis at the outer side, which does not show in the reproduction).

CASE XV.—J. M., aged six years. Fracture of elbow. The skiagraph shows a separation of the epiphysis of the external condyle.¹ Reduced as usual; put up on an internal angular splint.

Seven days. Much swelling and thickening.

Fourteen days. Still much thickening, especially about the external condyle. No abnormal mobility of condyle.

Twenty-four days. Swelling less. Flexion to 10° , extension 10° . Massage begun, but splint continued.

Thirty days. Union solid. Flexion 15° , extension two-thirds the normal range, pro- and supination practically normal. No displacement to be made out. Splint omitted.

Fifty-two days. Massage discontinued. Patient could not be found later.

CASE XVI.—G. S., girl of two years. Ether: diagnosed in accident room as a separation of the epiphysis with a T-fracture; reduced. Put up at a right angle.

Ten days. Comes in wearing an internal angular splint. Bones in good position. Flexion about three-fifths the normal. Pro- and supination normal. Considerable ecchymosis and swelling. No lateral mobility evident at or above the joint.

Thirteen days. Position good; external condyle still movable under the fingers; a click in joint when it is moved. There is no widening, no mobility between condyles and shaft, and no deformity. This would seem to have been an external condylar fracture rather than an epiphyseal separation and T, as the first examination alleged. No X-ray to confirm this, however.

Forty days. Firm union; excellent position; still has a slight

¹ The X-ray plate was lost later, but was examined by the writer soon after taking.

click in the joint. All motions good. To have massage. Sling only. Did not reappear. Could not be traced later.

In this series it will be seen that there are no proved cases of strictly pure epiphyseal separation, though in several of the cases the portion of diaphysis detached with the capitellum can hardly have been more than a scrap of periosteum. From the data of this series, it is not possible to say how constantly the outer edge of the trochlea separates with the capitellum, to which it belongs developmentally; from the lateral mobility found in some of the cases, however, from the frequent slight displacement of the ulna inward and from data of other observers, it seems probable that the epiphyseal line is usually adhered to, and that the outer trochlear ridge accompanies the capitellum.

Kocher,² who has had the exceptional opportunity for observation afforded by operations on three fresh cases and on one case of non-union, found that the typical fracture line passed along the epiphyseal line into the trochlea in all cases, and varied only in the size of the bit split off the outer side of the diaphysis. Fischer,³ in three cases of fracture with dislocation operated on, found the same fracture line. Other cases examined at operation have shown similar, if not identical, lines of break.⁴

The only museum specimens showing this type fracture fresh or without union seem to be those cited by Sir Astley Cooper;⁵ a specimen in St. Thomas's Hospital Museum; Schmitz;⁶ Annandale.⁷

Of united fractures where this was the apparent lesion may be cited a specimen in the Royal College of Surgery Museum, No. 945a (figured by Poland);⁸ a specimen described by Schmitz (*loc. cit.*); a dissecting-room specimen of Poland's.

The clinical occurrence of this type of fracture has long been recognized, but its epiphyseal character and its close adherence to a type have usually been but little appreciated, and its frequency perhaps underestimated.

Kocher,⁹ Helferich,¹⁰ Brun-Bourguet,¹¹ Poland,¹² and Mouchet¹³ have, however, described it adequately, and since skiagraphs have come to be published, the forms shown in the author's series may readily be verified (*c.g.*, in Mouchet's¹⁴ and in Frazier's¹⁵ series).

As to the displacement of this type of fractures, there seems to be a certain constancy. This displacement is often obvious in the skiagraph, but since the skiagraph of an elbow, especially if already in splints, is peculiarly liable to distortion, this evidence is to be taken conservatively. There are, however, cases enough to establish the conditions, where there has been opportunity for a direct anatomical examination of the joint.

The most usual displacement of the condyle is outward.

Kocher found this in two relatively fresh cases operated on, once with forward (his Case XIX), once combined with upward displacement (his Case XXI).

Schmitz's cases (two) showed like displacement up and out. So also Annandale's.

Displacement up and out is obvious in the plates of Langhan's specimen, figured by Kocher, and in Poland's dissecting-room specimen, as well as in Sir Astley Cooper's specimen of non-union, and in the various operated cases of non-union to be noted later.

An X-ray by Mouchet (his Case XXXII) shows this displacement, as do Cases IV and VIII of the writer's series in less degree; but it is not well, as has been said, to lay too much stress on the *displacement* apparent in these pictures.

Outward displacement, *in toto*, of the condyle alone is usually limited by the complete or nearly complete preservation of the ligamentous connections of radius and external condyle.

Hence, any considerable displacement outward or backward usually means a complete or partial luxation of the forearm. This sort of subluxation occurs to a considerable degree in the cases of non-union of the fractured condyle. Fischer¹⁶ has reported three cases where external condylar fracture was complicated with a luxation of the forearm backward, and

Payr's¹⁷ case (where the epitrochlea was also torn off) evidently belongs to the same class.

Inward displacement, as in a case of Stimson's and in the specimen figured by Bryant, must also necessarily be accompanied by a subluxation or luxation of the forearm. This displacement as a result of fracture of the external condyle is evidently rare. The *subluxation* to a slight degree seems clinically to be not uncommon.

Backward displacement, except in case of luxation, does occur (Mouchet did an excision where this was the condition), but is apparently usually slight, and likely to show rather rotation than total displacement of the fragment.

Forward displacement is usually slight. Kocher found it in one case operated on (his Case XIX), and Mouchet alleges it in three cases. In the author's series it was never more than of trifling extent.

Downward displacement is recorded in a case of Rieffel's.¹⁸ It is evidently not common as a primary position or in the end result, though readily produced in the manipulation of examination in fresh cases (with the arm extended). It was present before the second reduction in the writer's Case VI.

Much more important than the usually slight displacement *in toto* is the rotation of the fragment. It is very common, is a cause of deformity as we shall see later, and probably in its severer grades is a cause of the occasional failure of union.

Payr, Annandale, Kocher, Stimson, and Fischer have all confirmed the occurrence of this rotation in cases operated on. It is also shown in Langan's specimen. The rotation seems usually to have been a twist in two directions,—of the articular surface up and forward; of the wedge of attached diaphysis down and outward. In one of Kocher's cases (his Case XXII) there was a rotation of 180°, so that the articular surface of the capitellum came to rest on the fractured humeral surface.

Stimson¹⁹ found a rotation such that the fractured surface presented next the skin.

Fischer in his three cases describes a forward and upward rotation of "usually nearly 90°".

Mouchet in one case obtained an X-ray (his Case XXV) apparently showing a rotation of about 90° .

In the writer's cases this rotation in no case reached such an extent, but it is plainly to be seen in the skiagraphs of Cases I and III.

This rotation seems more constant than would be expected without some special cause. Such a cause is probably to be found in the intact ligaments connecting the condylar fragment to the radial head. Whether the rotation is caused by traction on this external lateral ligament at the time of the accident (a continuation of the upward force which produced the fracture rotating the fragment upward on the ligament as a fulcrum), or by subsequent manipulations, it would be hard to say. The first, however, seems the more plausible explanation.

As to the mechanism of this form of fracture, it is apparent from the above case record that at least a large proportion of these injuries result from falls on the elbow, probably with the arm abducted. But the occurrence of ecchymosis (early) on the outer side of the elbow in some cases (see IV, V, VIII, XIII) would seem to show that direct trauma *may* be the cause.

Kocher (on the adult cadaver) produced the fracture experimentally (*a*) by an oblique blow directly on the flexed elbow, (*b*) by a blow on the hand with the elbow flexed, the force being transmitted through the radius to the capitellum. He thinks the accident occurs clinically from falls on the flexed elbow with the arm abducted, the olecranon driving the external condyle before it.

Fischer produced the fracture in cadavers of children from nine to fifteen years by hyperextending, abducting, and then flexing the arm. He obtained backward luxation, with a fracture just inside of, or sometimes through, the capitellum.

SEPARATION OF THE WHOLE LOWER EPIPHYSIS.

This epiphysis, as has been pointed out, includes, up to the age of eleven or twelve years, the whole cartilaginous portion with both epicondyles. After this the internal epicondyle is no longer included. The pure epiphyseal separation is evi-

dently rare at any age, though a good many fractures here classified as supracondylar undoubtedly pass along a portion of the epiphyseal line. In the days before the advent of the X-ray accurate distinctions were possible only in compound cases; at this time many epiphyseal separations were reported; to-day there are apparently less of them. No cases of the pure epiphyseal separation are included in the writer's series, nor has he seen any save one doubtful case in a boy of eight or nine years, seen but once just after the accident, which was probably an incomplete epiphyseal separation.

Nor does Mouchet²⁰ in his summary of 101 X-rays give any instance of this injury as a *pure* epiphyseal separation.

The actual occurrence of the lesion is, however, attested by several specimens—notably two figured by Poland,²¹ one from the St. Mary's Hospital Museum, No. 94, the other from a child of four, a specimen in St. Thomas's Hospital Museum, No. 115. In both these cases the epiphyseal line was exactly followed.

In the many cases of compound separation, a careful examination of the data given often leaves it doubtful whether a pure epiphyseal separation is described, but in a certain number this has undoubtedly been the lesion.

Kocher thinks the pure separation most common from two to five years, but gives a case in a boy of eleven years where this diagnosis is made.

Hutchinson, Jr.,²² collected fifty-two cases which he classes as epiphyseal separation, but frankly states that probably only a minority were really pure separations, and thinks the pure separation rare after five or six years. Among other cases he cites one in a boy of thirteen years where the epiphyseal line was "almost exactly" followed.

Of cases of pure epiphyseal separation after twelve years (and hence not including the epitrochlea) the writer has chanced on but one, reported by R. W. Smith,²³—a compound case with a careful examination of the lesion.

It is noteworthy that in Poland's painstaking collection of

cases recorded, there appears no accurately determined pure separation after the age of about four years.

Probably, despite criticism, Faraboeuf was not so far wrong in stating that a pure separation of the epiphysis cannot occur after about four years.

SEPARATION OF THE EPIPHYSIS WITH INVOLVEMENT OF THE DIAPHYSIS.

This is the commoner form of epiphyseal separation. In the writer's series there is no fresh case, but the healed case, XXXVIII, probably belongs here. The extent of involvement of the diaphysis varies of course, and the portion of the diaphysis affected also varies. It may be a chip or scale from the inner side, as in a case of Hutchinson's²⁴ and two by Bardenhauer, or external as in another case of Hutchinson's²⁴ and in Champion's²⁵ specimen, or posterior as in another case of Bardenhauer's.

Partial separation of the epiphysis seems, so far as the data go, to be a rarity. Helferich²⁶ figures one such specimen.

The typical displacement of the epiphyseal separations, pure or involving the diaphysis, seems to be, as Packard long ago pointed out,²⁷ a backward displacement of the epiphysis: if there is deviation to either side, it seems more often to be outward. Poland figures one case with forward displacement.

In these, as in other epiphyseal separations, there is likely to be much stripping up of the periosteum. In a case reported by McDougall²⁸ the periosteum was stripped up for an inch up the shaft, and in a case of Maisonneuve's it was stripped up for an inch and a half in the shape of a sleeve, through a rent in the side of which the diaphysis protruded. See also the skiagraph of Case XXXV.

A striking feature of the recorded cases of this lesion is the frequency of compound injury. Poland records seventeen such cases collected from the literature. This is out of all proportion to the compound injuries in other forms of elbow fractures, and it is interesting in this connection to note that many

of these cases were a result of direct crushing violence or exceptionally severe falls.¹

We know that the epiphyses of the lower end of the femur and that of the radius at the wrist are more likely to give way to extreme violence, while the bone itself seems more usually to give way to less severe trauma. Evidently the same is true of the elbow epiphysis. Why this is so, the writer cannot even attempt to explain, any more than he can explain why this humeral epiphysis is evidently almost never separated in the first year of life, a period at which the experimental separation is astonishingly easy.

As to the mechanism of epiphyseal separation, the author's experiments on the new born showed separation to be readily produced by hyperextension, by abduction or adduction, or by a forward thrust from behind.

Curtillot²⁹ reached like results.

Mouchet found separation easy by hyperextension or by forced abduction in supination in cadavers up to three and a half years.

Stimson³⁰ found that epiphyseal separation or supracondylar fracture resulted from abduction and adduction in the extended position.

The writer, experimenting on a cadaver of six years by backward thrust, with the arm flexed, produced supracondylar fracture, not epiphyseal separation.

Clinically the causation by hyperextension is probably uncommon;² the injury may evidently result from falls either on the hand or on the elbow.

¹ The cases of Helferich (*loc. cit.*), of Polaillen (quoted by Mouchet), of Beach (Boston Medical and Surgical Journal, January 4, 1877), of Bryant, and the case of which the specimen is above referred to in St. Mary's Hospital Museum, were all the result of direct crushing by wagon-wheels and the like.

² An isolated case is reported by R. W. Smith where the injury was produced in a boy of twelve years by another boy falling across the back of his extended arm.

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- ¹⁵ Frazier: *University Medical Magazine*, 1897-8, x, p. 400.
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- ¹⁷ Payr: *loc. cit.*
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- ¹⁹ Stimson: *ANNALS OF SURGERY*, June, 1900.
- ²⁰ *Loc. cit.*
- ²¹ *Loc. cit.*, p. 272.
- ²² Hutchinson, Jr.: *British Medical Journal*, 1893, ii, 1417. Probably, as a matter of fact, this series also includes condylar and supracondylar fractures. The same must be true of Wolff's series (*Deutsche Zeitschrift für Chirurgie*, 1900, liv, 273) with seven alleged epiphyseal separations out of thirty-seven elbow injuries.
- ²³ *Proceedings Pathological Society*, Dublin, 1870, iv, 111.
- ²⁴ Hutchinson: *British Medical Journal*, 1893, ii, 1417.
- ²⁵ Quoted by Poland.
- ²⁶ Helferich: *Fractures and Dislocations*, Plate XXXVI, Fig. 1a.
- ²⁷ Packard, in *Ashhurst's Cyclopædia*.
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(TO BE CONTINUED.)

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 9, 1901.

The President, B. FARQUHAR CURTIS, M.D., in the Chair.

INTERSTITIAL PANCREATITIS; CHOLECYSTEN- TEROSTOMY.

DR. CHARLES L. GIBSON presented a woman, thirty years old, who entered St. Luke's Hospital on August 20, 1901. Her previous history was negative, with the exception of an attack of peritonitis, of obscure origin, from which she suffered several years ago.

Her present illness began about four weeks previous to the date of her admission to the hospital. It was ushered in with gastric disturbance; there was considerable epigastric pain and frequent attacks of vomiting. For several weeks she had been deeply jaundiced. A physical examination disclosed only a moderately enlarged gall-bladder, which could be distinctly felt on pressure. Under ether, however, a large transverse tumor above the umbilicus was made out. The gall-bladder was cut down upon and opened; it contained no stones. The large transverse tumor proved to be the pancreas, which was symmetrically enlarged throughout, the condition being due to a general hyperplasia of that organ. An anastomosis was made between the first part of the jejunum and the gall-bladder with a Murphy button.

The patient's convalescence was quite uneventful, and her symptoms improved at once. It is now about six weeks since the operation, and she is beginning to be restored to health and to take on flesh, although she has had one or two attacks of vomiting and epigastric pain since her convalescence. A small fragment of the enlarged pancreas was removed, and the clinical diagnosis of interstitial pancreatitis was confirmed by microscopic examination.

DR. B. F. CURTIS said it was rather an interesting question whether a fistula is necessary when there is not much distention of the gall-bladder. In a recent case which came under his observation there was a tumor of the gall-bladder and symptoms of obstructive jaundice. Operation revealed a tumor of the pancreas, probably carcinomatous; the gall-bladder was not much distended. In spite of this fact, he did a cholecystenterostomy on account of the marked obstructive symptoms, which were probably due to a periodical swelling and closure of the duct. Dr. Curtis said it seemed to him that with symptoms of obstructive jaundice we should make a fistula, whether the gall-bladder is distended at the time of operation or not.

RUPTURE OF PELVIC ABSCESS INTO BLADDER.

DR. SAMUEL ALEXANDER presented a boy, fourteen years old. He had always enjoyed good health and his family history was negative. He was admitted to the Bellevue Hospital on July 24, 1901. Four weeks previous to that date he fell on a spike, receiving a cut three inches long over the head of the right tibia. The wound was closed and healed without any trouble. About nine days later, on awaking in the morning, he found that he could not move the left leg on account of a pain in the corresponding groin. He was obliged to remain in bed for three weeks, and, as the condition did not improve under treatment, he was advised to go to the hospital. His chief complaint was a pain in the left groin, which was so severe that he was unable to extend the thigh.

Upon his admission to the hospital, the abdomen was slightly tympanitic, and there was a reddened area just above Poupart's ligament. His urine was alkaline, specific gravity, 1012; it contained much pus, at least 50 per cent. by bulk. A microscopic examination gave no evidence of a lesion of the kidney, and a bacteriological examination failed to show any tubercle bacilli. The case was regarded, therefore, as one of colon infection. A search of the bladder was negative.

On July 28, Dr. Alexander made an opening into the bladder through the perineum, and upon introducing his finger he found a dimple in the bladder wall: it was situated about an inch above the left ureteral opening and was large enough to admit the end of the finger. He thereupon made an intramuscular opening above the pubes; on pushing up the peritoneum, he disclosed a

large abscess cavity which followed the course of the psoas tendon and communicated with two large retroperitoneal glands. These were in a suppurating condition and removed. They were subsequently examined and showed no evidences of tuberculosis. Anteriorly, the abscess invaded the bladder-wall. The wound was closed with drainage; the patient made an uneventful recovery and was discharged on August 20. From that time on the urine was entirely free from pus until one week ago, when it again became somewhat cloudy. The microscopic examination for tubercle bacilli has proven negative.

Dr. Alexander said he had seen two cases of appendicular abscess opening into the bladder, but in this case the abscess was on the left side, and he was unable to explain its origin. He did not believe that the injury to the right knee had any connection with the abscess, and there was no tenderness over the spine.

Dr. GEORGE E. BREWER said that on two occasions recently he has encountered large retroperitoneal abscesses on the left side for which he could not find an adequate cause. His impression was that neither was tuberculosis, and the microscope failed to reveal any evidences of that disease, although inoculation experiments were made. In one of the cases it was suspected that the retroperitoneal space had become infected by an ulceration on the inferior surface of the descending colon. The source of the infection in the other case could not be found. Dr. Brewer said that both of his patients were adults.

Dr. ALEXANDER B. JOHNSON referred to two cases of suppurating iliac glands that had come under his observation. One was especially interesting because of the fact that the abscess which resulted was located in the appendical region, and when the case was operated on it was for a supposed appendicitis. Upon opening the abdomen he found a localized peritonitis, with an exudation of fibrin and cloudy serum. The tumor was found to consist of several very large and inflamed lymph nodes. They were removed, and small abscesses were found in the centre of all but one; in that one it was near the surface, and this had apparently caused the peritonitis. The patient recovered.

Dr. L. W. HOTCHKISS said he had seen one case of perivesical abscess, apparently retroperitoneal in origin, in Bellevue Hospital several years ago. In that case an external urethrotomy had been done elsewhere, and subsequently a gaseous abscess had

developed above Poupart's ligament. It was incised and drained, and was evidently the result of gas-bacillus infection. The infection had apparently spread from the wound in the deep urethra and extended along the retroperitoneal tissues to the point described. The patient died.

DR. CURTIS asked whether the prognosis in cases where the abscess bursts into the bladder was not regarded as favorable if treated by irrigation? The resistance of the bladder to infection is well known.

DR. ALEXANDER, in reply to Dr. Curtis, said the prognosis was favorable, excepting in the tuberculous cases. In the latter class of cases the process is usually primary in the bladder, and the outcome is very bad. Some years ago, the speaker said, he saw a case of tuberculosis of the sacro-iliac synchondrosis, resulting in a sequestrum which burrowed downward, and the process finally perforated into the bladder. Through a median lithotomy incision a calculus was removed which had a bone nucleus; this proved to be a portion of the ilium. After removal of the stone, his urinary symptoms subsided. Subsequently, an abscess developed over the side, which also invaded the bladder; but in spite of all this, that organ remained free from infection by the tubercle bacilli for four or five years; then he suddenly developed a tuberculosis of the bladder. Dr. Alexander said the prognosis is much more favorable in cases where the rupture takes place from without into the bladder than where it originates in the bladder and perforates outward.

CARCINOMA OF THE TRANSVERSE COLON.

DR. GEORGE E. BREWER presented a man, who was admitted to the hospital early last summer, suffering from an abdominal tumor about the size of a small cocoanut. It was moderately movable and situated just to the right of the umbilicus. The patient stated that for a number of years previous to the date of his admission he had been having digestive disturbances, slight in character, with eructations of gas, and more or less obstinate constipation. Three months ago he first had an attack which suggested intestinal obstruction. Since then he has had several such attacks, recently in rapid succession. He also suffered from severe vomiting, which led his physician to suspect some renal complication. During the past six months he has lost nearly fifty pounds in

weight, and when Dr. Brewer first saw him he was in rather poor physical condition. He had no appetite and was unable to do any work. His abdominal tumor did not appear to be connected with the kidney, and an examination of the urine proved negative.

An exploratory incision made through the right rectus muscle revealed quite a large carcinoma of the transverse colon. The ascending colon was very much distended, while the descending colon and that section of the transverse colon which was beyond the point of stricture were collapsed. The tumor was adherent to the stomach, gall-bladder, and duodenum, and also to the abdominal wall. There were evidences of a certain amount of peritonitis. As the case was clearly inoperable, the fecal current was re-established by anastomosing the ascending colon with the transverse at a point beyond the site of the stricture. When this was done, a large amount of decomposed feces escaped.

Since the operation the bowels have been regular. The man's health has improved and he has gained fifteen pounds in weight.

SUBCUTANEOUS INJURIES OF THE BRACHIAL PLEXUS.

DR. PERCY R. BOLTON read a paper with the above title.

DR. ANDREW J. MCCOSH said he had hoped that Dr. Bolton would make some allusion to postoperative paralysis due apparently in general to the arm being flexed under the head. In some instances such a paralysis is slight, while in others it is extreme. The speaker recalled one case where after a comparatively long operation, during which the man's arms were thrust behind his neck, complete paralysis of both upper extremities followed, and two years elapsed before the disability was permanently cured. Another case had recently come under his observation in London. The patient was a woman who had been operated on six months previously for gall-stones, and complete paralysis of one of the upper extremities followed. Such cases are of quite common occurrence, and have never been satisfactorily explained. It may be due to pressure of the nerves against the ribs or upon the head of the humerus.

In regard to other injuries of the brachial plexus, Dr. McCosh said he saw a case six months ago where a man was injured by an accident which jammed his shoulder outward and backward. Absolute paralysis of the right upper extremity followed the

injury, and nine months later, when the speaker first saw him, the right arm was entirely useless, and degenerative changes had begun in the skin and nails. He cut down over the brachial plexus and found it after half an hour's search: it consisted of an extremely dense, almost cartilaginous cord, which he first thought was the hardened scalenus muscle. Upon cutting it, it was found to consist of both muscle and nerve, which were amalgamated into a hard, fibrous, cicatricial cord. Nothing could be done to improve the condition of the arm.

In another case which he saw some years ago the plexus was injured, apparently, as the result of a fracture of the clavicle. The nerve was found to be infiltrated by a mass of hard, cicatricial tissue, which caused very extensive paralysis of the arm. In that case, Dr. McCosh said, he was able to dissect out the plexus from the fibrous scar tissue, which consisted of a mass about two inches long and an inch or more wide. The result was exceedingly satisfactory, the man being enabled to resume his duties as a railroad conductor.

DR. CURTIS said that anæsthesia paralysis, to which Dr. McCosh had referred, has occurred when the patient's arms were in various positions,—by the side, over the head, etc. The accepted rule seems to be to keep the arms moving rather than to let them rest in one particular position. The speaker said he had seen some very troublesome cases of paralysis of the arm following anæsthesia, usually in hospital practice, where the anæsthetist permitted the arms to remain in one position too long. Such an accident is likely to give rise to legal complications.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, October 7, 1901.

The President, DE FOREST WILLARD, M.D., in the Chair.

GUNSHOT WOUNDS OF THE ABDOMEN.

DR. ROBERT G. LE CONTE presented a negro man, twenty-seven years old, who was admitted to the Pennsylvania Hospital, September 7, 1901, at 11.57 A.M. Fifteen minutes before admission he was shot twice with a thirty-two calibre revolver. The first bullet caused a superficial wound of the left thigh; the second struck him in the back while he was running away from his antagonist. The estimated distance at which this shot took effect was twenty feet. Dr. Le Conte saw the patient two and a half hours after the injury was received. He was then in a highly excited condition, in part, perhaps, due to the fact that his antemortem statement had just been taken by a magistrate, and the necessary legal procedures had terrified him. He complained of intense cramp-like pains in the abdomen which made him cry out every few minutes. He was moderately shocked, with a rapid pulse and labored respiration which was almost entirely costal. The wound of entrance was three inches to the right of the fifth lumbar spine and on a level with the crest of the ilium, and a probe refused to pass beyond the latissimus dorsi aponeurosis. There was no wound of exit. The abdomen was universally tender, distended, and resistant, tympanitic in front and dull in the flanks. Liver dulness in front reached to the costal border. The man was etherized, placed on his face, and the skin of the back carefully disinfected. As the probe still refused to enter, the skin wound was enlarged sufficiently to see where the bullet had separated the fibres of the aponeurosis. These were divided and a finger was carried along the track of the bullet to the crest of

the ilium, where two or three splinters of bone were encountered. The bullet had then passed beyond the reach of the finger. It being thus certain that the missile had penetrated the peritoneal cavity from behind, a rubber drainage tube was inserted in its track and the skin incision closed. The patient was then turned on his back, the skin of the abdomen carefully disinfected, and a six-inch incision made in the median line, the centre of which was the umbilicus. On opening the abdomen, fluid blood immediately gushed out. The quantity was estimated at six pints. The whole of the small intestine was hastily drawn out of the abdominal cavity to the left of the incision, and surrounded with hot, wet gauze. In doing this a perforation of the small gut was seen. Its position was noted and the place covered with gauze to prevent further extravasation of fæcal material. The abdominal cavity was then cleared of blood by scooping it out with the hand and with gauze sponges, and it was seen that the bullet had perforated the upper portion of the mesentery, severing one of its large vessels. As it emerged from the mesentery it had torn an opening one inch long in the transverse colon. The hæmorrhage was readily controlled by suture, the wound of the colon repaired, and the perforation of the small gut closed with silk. No further damage was found. Twenty pints of hot salt solution were used in washing out the abdominal cavity and the surface of the intestines, a glass drainage tube was inserted, and the wound hastily closed with through and through silkworm-gut sutures. During the operation the patient's pulse had become very rapid and feeble, and an assistant opened the median cephalic vein and introduced five pints of hot normal salt solution. As the bullet had almost certainly lodged in the anterior abdominal wall and was out of harm's way, no search was made for it, the patient's condition being so precarious as not to warrant any further interference.

Immediately after operation the patient's temperature was 98.4° F., the pulse 160, and respiration 60. Eight hours later the temperature had risen to 101°, while the pulse and respiration had dropped to 124 and 44, respectively. He vomited twice while coming out from the effects of ether. The convalescence was uneventful. At the end of twenty-four hours one-sixth of a grain of calomel with a mouthful of water was given hourly for six doses. This was followed by an enema which was very

effectual. As soon as the bowels were opened he was placed on peptonized milk, and the diet gradually increased from day to day. At the end of forty-eight hours the abdominal drainage tube was dry, and it was removed. At the time he received his injury he was suffering from a mild bronchitis, and during the convalescence he had some cough with free expectoration. This was partially controlled by heroin; but the paroxysms of coughing everted the edges of the wound in three places, although none of the sutures gave way. The stitches were removed on the eleventh and the patient was out of bed on the twenty-second day.

In connection with this case, Dr. Le Conte said that until within a few years ago a gunshot wound which opened any part of the alimentary tract was considered fatal unless operation was undertaken, and even then almost all cases died. At that time gunshot wounds were alike in that they were dirty, usually infected, lacerated wounds, made by a comparatively large lead bullet of slow velocity. To-day one meets with a wound of very different character, made by a clean, small, steel bullet, of high velocity. When such a missile has attained its true flight, it leaves a clean, sharp-cut wound, splitting the tissues as a wedge rather than tearing its way through. Penetrating abdominal wounds with a lead bullet he believed to be as fatal to-day as ever they were, if expectant treatment is pursued; but military statistics of field operations show that wounds inflicted by the modern weapon have proved much less fatal under expectant treatment than when operation has been undertaken. This is scarcely to be wondered at when one considers the surroundings under which operations were performed after battle in field hospitals, where the medical department had an immense work to do with scanty supplies and few assistants. But if such wounds presented themselves in a city hospital, with all the modern conveniences for aseptic work, no surgeon would hesitate between expectant and operative treatment. Wherever one could open an abdomen with safety he believed that every penetrating gunshot wound demanded operation, no matter what may be the character of the bullet that inflicted it.

Shock in such cases is almost invariably associated with hæmorrhage, and its severity is almost directly proportional to the amount of blood lost. Occasionally, however, it is profound

where hæmorrhage has been slight, and in such cases it is probable that the bullet has done very extensive injury to the hollow viscera, or perhaps some important nerve trunks. Under such circumstances what benefit can accrue by delaying operation? An anæsthetic is of course much more dangerous in the presence of a profound shock, but its increased danger in no way counterbalances the benefits derived from its use. It permits the surgeon at once to get at and control the cause of shock by preventing further hæmorrhage or greater soiling of the peritoneum; it enables him to repair the injuries inflicted and to reduce the dangers of septic infection to a minimum, and at the same time permits the use of the two most valuable remedies for combating shock, namely, intravenous injection and douching the abdominal cavity with hot salt solution. He would therefore urge that if operation is to be undertaken it be done immediately, as every half-hour of delay proportionately decreases the chance of success.

When the wound of entrance or of exit does not give a positive sign of penetration, as protrusion of omentum or escape of fæcal material, it should be carefully enlarged until the peritoneum is reached, when sight or touch will tell of penetration. One should never take for granted that the abdominal cavity has been invaded from the apparent course the bullet has taken, nor from the tenderness, distention, muscular rigidity, or shock that may be present. All of these signs may be present without an opening in the peritoneum. Four or five years ago he saw a woman who had been shot with a revolver. The wound of entrance was on a level with the anterior superior spine of the left ilium and about two and one-half inches to its inner side. The apparent course of the bullet was directly inward and there was no wound of exit. The patient was considerably shocked, slightly tympanitic and distended, with rigidity of the left rectus and marked local tenderness. He was confident the abdominal cavity had been opened, but proceeded to assure himself of it by exploring the wound. It was then proved that the bullet had ranged downward, and had penetrated to but not opened the peritoneum, passed under Poupart's ligament, and lodged in the muscles of the thigh. The woman was very stout, with a pendulous abdomen, and as she reclined on her back the wound of entrance was on a level with the anterior superior spine of the

ilium, but in the standing position, the position in which she was shot, the wound assumed a relatively lower place.

Penetration having been ascertained, where the incision for exploring the abdominal contents should be made should depend upon two factors,—the position of entry and the course the bullet has taken. If the missile has penetrated outside the semilunar lines and at a right angle to the anterior abdominal plane, he should prefer to open the abdomen in the semilunar line, rather than enlarge the wound sufficiently to make careful search of the abdominal organs. If it has entered in the same plane but passed inside the semilunar line, he should prefer a median incision, unless it is in the region of the liver, when a curved incision below the border of the ribs gives the best exposure. When the bullet has entered the flank or back, and ranged across or diagonally across the abdomen, he should always prefer a median incision, except when the liver is probably the only organ perforated. An incision through the median line or semilunar line saves time, as it can be enlarged or closed more quickly than when through several layers of muscle; it permits of a more extensive and thorough examination of the abdominal contents, and also a better cleansing of the same.

In operating for gunshot injuries, it has always been his practice to treat the track of the bullet as septic until it has proved itself otherwise, and he had drained such wounds in all portions of the body. If, in addition to a septic bullet, the alimentary canal has been opened, the indications for drainage become doubly imperative. If the bullet has penetrated the lesser peritoneal cavity, this also should be drained by an opening in the flank. When the patient's skin has been properly cleansed, and the drainage tube carefully attended to, the risk of infecting peritoneum from outside sources must be very slight, certainly very considerably less than the dangers arising from the presence of septic material in a closed cavity.

As to a search for a bullet that remains in the body being made at the time of operation: If in the examination of the abdominal organs for injuries received, the bullet is not encountered, it generally proves that the missile has passed beyond the peritoneal cavity, and probably lodged in muscular tissue. Under such circumstances he would make but a very short search for it when the patient's condition is good; if his condition is serious, he

would not hunt for it at all beyond the peritoneum. When embedded in muscular tissue, its presence causes no immediate danger. At some later period it can be accurately located by a radiograph, and it may then be removed without danger. Time spent in cleansing a large area of skin around the proposed incision is always well expended; and if the patient's condition is so grave that one dare not spend the time for this, operation should not be undertaken.

Several years ago, before the days of normal salt solution or intravenous injection, when speedy operations seemed the most successful, he operated on a case of gunshot wound of the liver. The wound of entrance was in the back, the ball having passed through the pleura, diaphragm, and whole thickness of the liver, and lodged under a rib in front. The man was profoundly shocked from loss of blood. He enlarged the opening in the back and packed the liver wound as thoroughly as possible from this position, and then made a curved incision along the border of the ribs and completed the packing of the liver from the front. The patient's condition was so serious that he did not spend over three or four minutes in cleansing the skin of the abdomen. He was dying from hæmorrhage, and it had to be stopped soon. He reacted well from the operation, but died on the fifth day from septic peritonitis. A post-mortem examination revealed the wounded liver in excellent condition. No further hæmorrhage had taken place, and the bullet-track was filled with organizing sterile clot. The infection had started from the skin of the abdominal incision, and was traced layer by layer through the abdominal wall to the peritoneum, where it became diffused. In trying to save the man from a death by hæmorrhage, he had condemned him to one from peritonitis. Had ten or twelve minutes been spent in disinfecting the surrounding surface of the abdomen, infection most probably would not have taken place, and the man would have undoubtedly recovered.

DR. RICHARD H. HARTE reported the case of a man, aged nineteen years, who, while out gunning on the afternoon of July 27, attempted to remove his rifle from one boat to another, and in so doing discharged the weapon so that its contents, a long 22-calibre bullet, entered his abdomen along the right side of the rectus muscle, one and one-half inches above the umbilical line. He was hastily removed to the Pennsylvania Hospital.

which necessitated a long drive in a wagon, so that nearly six hours had elapsed from the time of the receipt of the injury until Dr. Harte saw him in his bed in the hospital. His condition at that time was fairly good,—temperature, 99.2° F.; pulse, 102; respiration, 30. On examination a small wound was found, its point of entrance being one and one-half inches above the umbilical line, and just at the right margin of the rectus muscle, with no corresponding wound of exit on the posterior part of the body. The abdomen, on examination, was tender, with marked muscular rigidity, especially in its upper right segment, leading to the belief that the missile had punctured and wounded some of the abdominal contents; although a probe could not be carried any distance into the wound owing to obstruction apparently from some fibres of the rectus muscle. The patient was made aware of the gravity of his condition and told that an operation was necessary, to which he readily assented.

At eight o'clock, six hours after the receipt of the injury, he was etherized, and the abdomen opened in the line of the wound corresponding to the right edge of the rectus muscle. Considerable hæmorrhage was present and some blood-clots found close to the parietal peritoneum. Careful cleansing soon revealed its source in the margin of a penetrating wound of the upper part of the duodenum, the missile having made an opening which would admit the little finger, producing what Mr. Making calls a grooved wound of the intestine; in fact, it was as sharp and clear as though it had been cut from the upper margin of the intestine with a gouge, from the edge of which there were several small vessels freely bleeding. The opening was easily closed with a single row of continuous sutures, again fortified by a row of Lembert sutures approximating the edges of the intestinal wound transversely, which is less liable to reduce the lumen of the gut than if closed longitudinally. In the mesentery, just below, was quite a large hæmatoma, which was incised, the clot removed, and the cut edges of the mesentery closed with a continuous suture. This apparently controlled all bleeding in the anterior portion of the abdomen. On tracing back the supposed course of the ball, a large amount of fluid blood was found in the fossa posterior to the liver, and alongside of the vertebra, which was removed, where another large hæmatoma was discovered extraperitoneally and in close relation to the kidney, but

no other point of bleeding was found in the abdomen, which was then thoroughly cleansed and the abdominal wound closed, three pieces of gauze being left in for drainage.

A temporary dressing was applied and the patient turned upon his face. Another incision was then made in the back, exposing the kidney, and enabling the blood-clot to be removed and several small vessels tied. Apparently no injury was done to the kidney or to its circulation. The posterior wound was closed and the layers of fascia brought together with buried sutures, leaving a small space for a gauze drain, and a permanent dressing was applied over both wounds. The patient reacted very well and passed a fairly comfortable night.

On the fourth day all the packing was removed from the abdominal wound and one piece replaced. This was followed in a few days by some slight suppuration; otherwise the convalescence was uninterrupted, save a rise in temperature at the end of the fourth week and a corresponding rise a week later.

Dr. Harte said that this case was interesting as illustrating how little can be determined in abdominal injuries until the abdomen is opened and explored. If it had been treated expectantly, the result would have been disastrous. Mr. Making, speaking of gunshot wounds of the small intestines which occurred during the Boer war, says that in the majority of cases which recovered spontaneously, the injury was not of a perforating nature, and that in five cases in which the injury was certainly diagnosed in the hospital death occurred.

He divides these injuries of the small intestines into three classes:

(1) Those which die shortly after the receipt of the injury, where the external wound is large, with consequently much hæmorrhage and shock, and which are regarded beyond the bounds of surgical aid except if immediately seen after the injury.

(2) Those cases which find their way to the field or stationary hospital, whose symptoms are of moderate severity, or even of an insufficient character, in which evidence of septic peritonitis suddenly develops and death ensues.

(3) Cases in which the position of the wound raises the possibility of injury to the intestine, but in which the symptoms

are slight or of moderate severity, and which recover spontaneously.

In military surgery it would appear, for various reasons, that the expectant treatment of abdominal wounds, especially from small calibre bullets, is the one on which most dependence can be placed. Mr. Making again says that he only saw one successful case in which the small intestine had been treated by excision and the insertion of a Murphy's button; he learned of two cases in which the large bowel had been successfully sutured, and a similar case where the small intestine was sutured with a favorable result.

In the case just reported no special attempt had been made to locate the bullet. In his opinion too much stress is often placed upon the removal of bullets, and much harm often results from unnecessary interferences in seeking for bullets which otherwise would be harmless. In fact, they should not be interfered with unless some obvious reason exists. Of course there are exceptions in bullets lying immediately beneath the skin, or quite superficially to it, or at the bottom of an infected tract where they cause secondary suppuration, or where they cause pressure upon important structures, especially nerve trunks, or, again, where the bullet is in close proximity to a joint, interfering with its function. These, of course, all demand removal by surgical interference. On the other hand, bullets sunk in the great cavities of the body, or in positions difficult of access, are much better left alone, and should never be interfered with unless the symptoms demand surgical interference for their removal.

DR. WILLIAM L. RODMAN said that in cases of gunshot wound of the abdomen one should not wait for the subsidence of shock, but should proceed at once to open the abdomen, because in the great majority of instances shock is due to hæmorrhage, and if one waits for the subsidence of shock, he will wait until the patient dies. Nothing has been more exaggerated than the amount of shock that arises from gunshot wounds of the abdomen unaccompanied by hæmorrhage. He had seen seven perforations of the intestine, and yet the patient had a normal temperature and a pulse of 72. In a second case he had seen a normal temperature and pulse of 80. If there was a great deal of shock due to hæmorrhage, it was not best to wait, but to proceed at once to do a laparotomy.

There was one position taken by Dr. Le Conte which he would be disposed to question a little. He did not say he would never enlarge the incision, but his testimony would be to let the bullet opening alone and to open in the middle line or semilunar line in the majority of cases.

There is much to be gained by following the bullet. In the first place, the danger of converting the non-penetrating into a penetrating wound of the abdomen is avoided by following up the bullet. If done with the finger instead of the probe, the perforations in the gut are found more quickly immediately under the bullet-wound than when the abdomen is opened in the median line. There is a disadvantage in opening the cavity well to one side, and yet he had done so in two instances: one where there was a double wound of the intestine. In this latter case the man was in general peritonitis, and had been shot fifty-one hours before the operation, but he made an excellent recovery. The line of the bullet should be followed in the great majority of instances; then, if it be found that the incision does not give access to all abdominal contents, it is easy to supplement it by median laparotomy.

Time is usually saved by following the bullet, and this is oftentimes of the greatest moment. He thought that wounds made by balls of large calibre should always be regarded as septic wounds, as these balls will, in the vast majority of cases, if not always, carry in foreign bodies with them. It has been very rare not to find pieces of foreign body along with the bullet, or probably find the foreign body and not the bullet. He remembered one case where he took out a piece of felt that had been agglutinated to the intestine. Drainage should practically always be made in penetrating wounds of the abdomen. He never knew of a case of shot-wound of the intestines or stomach to recover where drainage was not made.

As to the reference made by Dr. Harte to the treatment of such injuries on the battle-field. Treves and MacCormac during the Anglo-Boer war, and practically all of our American surgeons in the late war with Spain, taught that soldiers with gunshot wounds of the abdomen did best if not operated upon. We cannot question the position military surgeons have taken for the past four or five years concerning penetrating wounds of the abdomen on the battle-field. In the first place, everything is

unfavorable for operating such cases. The congestion along the firing line and in field hospitals, with their poor equipment, make it simply out of the question to do ideal surgical work. In the second place, the modern rifle-ball, which is .30 of an inch in diameter, is made of steel or steel jacketed, or covered with cupro-nickel, and goes with the greatest velocity, revolving on its long axis at the rate of over 2000 revolutions a second, and when it enters the tissues cuts like a knife; therefore extravasation of the alimentary contents, even in case of undoubted injury, may not occur, as the opening may quickly close. That many soldiers in our own and the British armies recovered after undoubted perforation of the alimentary tract cannot be doubted, though we may question whether so large a per cent. as many think recovered from *undoubted intestinal wounds*. Who can say that many of the *supposed* cases of perforating wounds of the intestines really were of such nature? They may have been perforating wounds of the abdominal cavity, and yet, on account of the empty state of the alimentary tract, it might have escaped injury. We know that soldiers often fast when on forced marches; that they frequently suffer from diarrhœa, both of which conditions would favor emptiness of the gastro-intestinal tract and make wounds of the stomach and intestines less likely to occur. He had seen a man shot through and through, the ball entering just below the ensiform cartilage without injuring either stomach or intestine. It lodged behind the eleventh dorsal vertebra, and unquestionably traversed the peritoneal cavity. He was a telegraph operator, who could not leave his key, and had taken nothing in his stomach for twenty-four hours. He was shot with a pistol-ball of large calibre (44). He had not the slightest symptom referable to the stomach or intestine. He was immediately paralyzed in his lower extremities, and some months after the injury Dr. Rodman did a laminectomy, and removed the ball from the spinal cord opposite the eleventh dorsal vertebra. At last account he was still living; the paralysis, however, remaining.

DR. LE CONTE rejoined that Dr. Rodman had probably misunderstood him when he said that he did not advocate opening in the line of the bullet. Dr. Le Conte always does that until he finds out that the peritoneal cavity has been entered, and then prefers abandoning this exploratory incision and opening the

abdomen in either the median or semilunar line, believing that such openings can be extended and closed much more quickly, and the abdominal cavity can be explored more thoroughly and better cleansed.

DR. HARTE agreed with the last remarks of Dr. Le Conte in regard to the opening of the wound. Of course he always explored the external wound and determined, if possible, whether it be perforated or not. If so he makes an opening, preferably in the median or semilunar line, since it is a mistake to sacrifice muscular tissue except where it cannot be avoided, as there is always more or less difficulty in closing the wound later on, and there is much more liability to hernia than if the abdomen is opened in either of the above-mentioned places. In regard to the possible presence of foreign bodies in the wound, this is a condition which we are liable to see a great deal of in civil practice, especially where missiles are used of slow velocity. Here we invariably have particles of clothing carried in before the projectile and left in the wound, leaving all the conditions favorable for infection later on. It has been the experience of surgeons that wounds thus received are very much more apt to become infected than where the modern high velocity missile is used, as in military practice; and this explains why a certain percentage of abdominal wounds that were received in the Spanish and Boer wars recovered, which otherwise, if they had been inflicted with a slow velocity bullet, would unquestionably have resulted fatally.

The character of the wound as ordinarily seen is a lacerated, contused wound, such as was seen during the late Civil War. The modern bullet, on the other hand, with its high velocity, produces practically an incised or punctured wound. As to drainage, he was strongly in favor of drainage in these wounds, especially when there is any involvement of the bowel. He preferred the use of gauze rather than the tube as being much better in absorbing any leakage, and it is certainly very much better borne by the intestine, with which it is bound to be more or less in direct relation. A glass drainage tube carried down and left in the abdominal cavity in contact with the intestine is very often responsible for the faecal fistulæ which so often follow abdominal operations, especially when there is some involvement of the bowel.

DR. DE FOREST WILLARD emphasized the septic condition of these wounds and the necessity for drainage. With all slow-moving missiles some septic infection is almost necessarily carried in.

As to the question of shock, he remembered one Fourth of July night seeing a man accidentally shot at fifty feet. He reached him within two minutes from the time he dropped in the street. Although he had only received a small bullet wound in the muscles of the back, yet that man was apparently dying from shock, so profound and complete was it. Hæmorrhage was but slight. The element of fright was undoubtedly largely accountable for the depression, which lasted for twenty-four hours.

INTRA- AND RETROPERITONEAL HÆMORRHAGE AND TRAUMATIC RUPTURE OF THE MESOSIGMOID.

DR. GEORGE G. ROSS reported the case of a man, aged twenty years, who had been always in good health until eight hours before admission to the German Hospital, having been injured in a fight by being struck or kicked on abdominal wall. Two days prior to admission he had been struck in the left loin by a piece of machinery. Following the fight he felt weak, but otherwise all right. He walked several blocks to the Park to cool off. About 11.30 P.M. he had severe pain in abdomen and went home and to bed; felt somewhat better for a short time, but the pain again became severe. He then came to the hospital and was admitted about 4 A.M. on June 17. On admission the temperature was 98.2° F., pulse 72, and of good volume. The abdominal wall showed no evidence of traumatism. His face was severely bruised and showed numerous ecchymoses and one contused wound on the upper lip. The abdominal muscles were somewhat rigid, no dulness, no tympany, but he had severe cramp-like pain, for which a hypodermic injection of morphia, one-fourth grain, and ice-bags to the abdomen were ordered. Patient went to sleep; about 8.30 A.M. again complained of pain; temperature 98° F., pulse 84, good volume. Abdominal muscles rigid, but no tympanites. Ice-bags removed about 9.30 A.M., as patient complained of feeling cold; temperature 97.8° F., pulse 124, skin cold and clammy. A mass could be felt in the right iliac fossa.

Immediate operation advised; but there was considerable delay in gaining consent of parents.

At the time of operation patient was in a state of collapse; temperature 97° F., pulse about 160, but could not count with any accuracy.

Patient given intravenous injection, saline solution, 3000 cubic centimetres, temperature 120° F. prior to operation. Under ether, an incision, about five inches long, was made through left rectus muscle. On opening the peritoneum a large quantity of free blood escaped. General cavity washed out with saline solution. Intestines found intact. There was an extensive hæmorrhage between the layers of the mesentery and some hæmorrhage under the peritoneal coat of the large bowel at several points. The outer layer of the mesosigmoid was denuded of its serous coat for about four inches, giving origin to the intraperitoneal hæmorrhage. In addition to the intraperitoneal hæmorrhage, a large collection of blood was discovered behind the peritoneum. The origin of the retroperitoneal collection was not discovered or searched for.

The serous coat of the mesentery was sutured with fine silk. After completing the toilet of the peritoneal cavity, two pieces of iodoform gauze were packed in to stop the oozing from the mesenteric wound, and to aid in controlling the retroperitoneal hæmorrhage by pressure. The abdominal incision was partially closed with silkworm-gut sutures.

During the operation the pulse was very weak. Saline again injected into the median basilic vein (4000 cubic centimetres). The pulse fell after operation from 152 to 96, and his temperature came up from 97° to 99° F., so that he reacted promptly from shock. This prompt reaction was the result of the intravenous transfusion and the controlling of the hæmorrhage.

The convalescence of the patient was interrupted by the development of a fæcal fistula, which made its appearance on the eighth day, or twenty-four hours after the removal of the gauze packing. The fistula was due, apparently, to the pressure of the gauze upon a weakened and badly nourished portion of the bowel, as the torn mesenteric vessels would naturally favor necrosis of the area which they normally supplied. The fistula healed spontaneously on the sixteenth day. The subsequent history was uneventful, and on August 1 he was discharged, being

the forty-fifth day after operation; his temperature and pulse having been normal for seventeen days.

The patient was readmitted to the hospital on August 6, having been home six days. Upon admission, he complained of severe pain in the epigastrium, running into left loin and lower abdomen. Vomiting, profuse and dark brown in color, began the evening previous to admission. He said his bowels had not been moved for twenty-four hours, but he had a stool shortly after admission.

Upon admission the patient had a temperature of 99° F. and a pulse of 96; great pain and tenderness upon palpation in the epigastrium and left loin. The abdomen was not distended, but there was an area of tympany corresponding to the position of the stomach and gastric flexure of the colon. The loin space was flat posteriorly; the tongue was coated; each act of vomiting temporarily relieved the nausea. The vomited matter was not fecal in odor or appearance. His condition generally became worse; the pulse increased in rapidity until it reached 160 on August 8, two days after his readmission. The temperature reached 100-102° F. His bowels had moved on the 6th and on the morning of the 7th of August. After this stool the obstruction seemed to be complete, for he passed no flatus and his condition grew steadily worse. A diagnosis of slow obstruction, the result of contracting adhesions, was made; on the 8th he was operated for its relief.

The old cicatrix was excised. Upon opening the peritoneum, the small bowel and sigmoid were found to be matted together in numerous places. The obstruction was not due to a single band of adhesion, but to compression of the adherent mass of bowel caused by the contraction of the entire mass. The adhesions were broken up and the bleeding points ligated, but in doing so the serous coat of the bowel was torn in several places. The rents were repaired, and an opening in the bowel at one place was closed by Lembert's sutures. The abdominal wound was closed by through and through sutures. He never fully reacted after the operation, and died on the third day thereafter.

On the second day after operation he had a very good bowel movement and passed considerable flatus. His temperature gradually became higher until it reached 100-104° F., and the pulse ran up to 150, weak and running. The cause of death was a

general purulent peritonitis, probably from infection through the weakened and denuded bowel.

The autopsy proved the correctness of the diagnosis and the fact that the obstruction was not the immediate cause of death.

The cause of the retroperitoneal hæmorrhage was not discovered. The urine did not contain blood at any time during the illness, so the kidney must be excluded as a causative factor. It seems probable that it arose from the torn mesenteric vessels before they entered the layers of the mesentery.

COMPOUND FRACTURE OF THE ANTERIOR FOSSA OF THE SKULL.

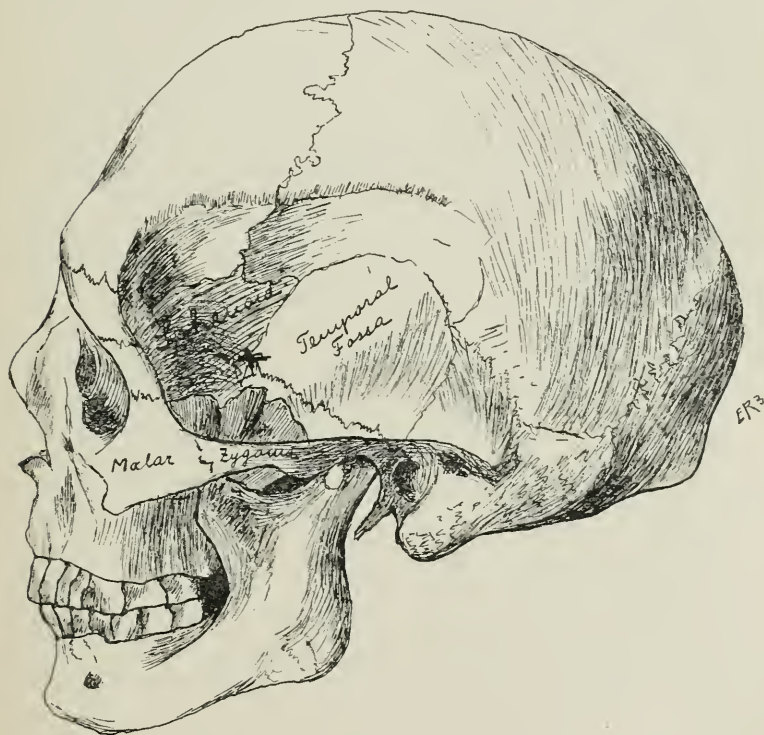
DR. ROSS reported also the case of a man who was admitted to the German Hospital, June 6, with a contused and lacerated wound of the left temple just over the external angular process of the frontal bone, the injury having been received the previous day. There was oozing from the wound. Hæmorrhage had been quite free from the nose, and there was some oozing from the left external auditory meatus. Upon probing the wound the bone could be felt, but there was no positive symptoms of fracture. His pupils were equal; there was no paralysis. He was mildly delirious and restless. Temperature was 100-104° F., pulse 96, and strong. A provisional diagnosis of concussion of the brain was made, and calomel, Dover's powder, and ice-bag to the head were ordered. There was an area of emphysema about the wound, which was later found to be due to the communication with the nose.

The day following his admission the left pupil had become fixed midway between dilatation and contraction, and the periods of unconsciousness were longer in duration and more profound. Thirty-six hours after admission and nearly forty-eight hours after injury he developed a paralysis of the left side of the face involving the muscles of the eyelids, the mouth, and cheek. His left pupil remained fixed. There was no paralysis of the body at any time. He was more profoundly unconscious, but not comatose.

The diagnosis was revised to fracture of the anterior fossa with contusion of the brain, with areas of hæmorrhage in the cerebrum. It was a matter of doubt as to whether there was a depression of fragments and extradural hæmorrhage arising

from laceration of the anterior meningeal artery, or whether his condition was due to the contusion and cerebral hæmorrhage.

There was also some doubt as to the involvement of the base of the skull. The external auditory canal was full of blood and there seemed to be some oozing, but it could not be said with positiveness that the blood had not run backward from the external wound and collected in the canal. In view of the doubt, it was decided to explore the wound.



Line of fracture to the mark X was plainly seen, from X backward the fracture is a surmise.

The original wound was enlarged, and a fracture of the external angular process of the frontal and a portion of the malar bone was discovered. Upon further search, a fissured fracture of the orbital plate of the frontal bone was made out. The line of fracture extended backward and downward, involving the greater wing of the sphenoid. This much of the fracture was

plainly demonstrated. The accompanying diagram illustrates the line of fracture. Beyond the mark \times the line of fracture is a matter of surmise, as the patient recovered, and it was impossible to demonstrate the exact facts.

It seems probable that the petrous portion of the temporal bone was involved, as evidenced by the bleeding from the ear and the line of fracture. The emphysema about the eyelids and external wound points towards a communication with the nose. There were no depressed fragments.

The wound was drained and dressed. The external auditory canal and nose were cleansed and packed with gauze.

The patient recovered, and was discharged forty-two days after operation. His temperature and pulse ran a practically normal course throughout the convalescence. He developed a pachymeningitis, and continued to have attacks of mild delirium, which became gradually less marked, and finally disappeared altogether. The left pupil remained fixed, and the paralysis of the eyelids remained at the time of his discharge.

ANEURISM OF THE THORACIC AORTA OF TRAUMATIC ORIGIN: TREATMENT BY INTRODUCTION OF WIRE AND ELECTRICITY.

DR. DE FOREST WILLARD submitted a supplemental report to the original paper presented February, 1901, to the Academy, and published in the *ANNALS OF SURGERY*, July, 1901, p. 143.

The man returned to the hospital two months later suffering with increased pain and dyspnoea. The tumor beneath the pectoral muscle at the anterior border of the right axilla had decidedly increased in size, having evidently eroded the ribs. The principal suffering, however, was in the left chest posteriorly, probably from erosion of the vertebræ.

Twenty feet of No. 24 silver wire were inserted through a long hypodermic needle, and a galvanic current of eighty milliamperes applied for one hour. The patient bore the operation well, and was relieved of pain even on the left side, owing probably to change in the direction of the blood current. The wire, however, evidently failed to produce coagulation in the right thorax, and the tumor, having lost the restraining power of the ribs, increased rapidly in size, lifting the entire right pectoral. Although the walls became very thin, the sac did not burst, and

the patient died slowly from exhaustion four weeks after the second operation, five months after the first operation.

In spite of every effort, he was unable to obtain permission for an autopsy, and the exact point of original rupture of the aorta must remain in doubt.

Since the above report was written, Dr. Matas has published an able article on the subject ("American Medicine," June 22, 1901, page 546; also Transactions of Southern Surgical and Gynæcological Association, 1900), and Dr. Leonard Freeman also read a paper before the American Surgical Association at Baltimore, May, 1901.

One of the dangers of gelatin injections is reported in the *Journal of the American Medical Association*, October 5, 1901, page 923; two deaths being reported from tetanus.

REVIEWS OF BOOKS.

OPERATIVE SURGERY. By JOSEPH D. BRYANT, M.D. Two Volumes. New York: D. Appleton & Company.

Most works on general surgery include a chapter on operative surgery. This is usually brief, and the descriptions mere outlines of the technical work, quite inadequate to instruct the tyro and of no use to the operating surgeon. Operative work constitutes the art of surgery, and its proper performance requires a high degree of skill and technical knowledge, consequently, a conscientious man will not be satisfied with the perfunctory descriptions in general works, but will endeavor to supply his deficiencies by the perusal of volumes specially devoted to operative technique. That a treatise of over a thousand pages is insufficient to describe all the operations done for the relief of disease, injury, or deformity, omitting, as it does, all reference to gynæcological surgery and the surgery of the eye and ear, is in itself ample proof of the inadequacy of the brief treatises contained in the usual works which are upon the book-shelves of our libraries. The man who does surgery but seldom, or in an emergency, is the very one who stands most in need of a full description of an operation elucidated by abundant plates. He does not want a sketch. He wants the minutest account of what is to him a novel procedure. As for the hospital surgeon who operates, perhaps, every day, it is certain that his necessity requires that he be in possession of the most complete and exhaustive treatise upon his art, as he may at any time be called upon to perform an unusual operation for a rare condition or injury. This work of Dr. Bryant will serve both the occasional and the every-day operator. It contains clear descriptions of standard procedures, also personally conducts the reader into the less travelled paths and byways of the art. The tyro may learn

the technique of an operation for strangulated hernia, the hospital man all the approved, even to the most recent, methods of gastrotomy, and other rare operations.

Dr. Bryant's work should be on the shelves of every practitioner who is likely to be called on to perform a major surgical operation. It goes without saying that it will find a place in the library of every surgeon who desires to keep abreast of the times. Volume one treats of the ligation of arteries, operations on the nervous, osseous, and muscular systems, amputations and deformities. Volume two treats of regional surgery. The two volumes are profusely illustrated with engravings that really teach. The half-tone method has been but sparingly used, greatly to the advantage of the work; for, while the newer process may be more artistic, the older methods are certainly more conducive to clearness, and thus enhance the value of the work for teaching purposes.

ALGERNON T. BRISTOW.

PRINCIPLES OF SURGERY. By N. SENN, M.D., Ph.D., LL.D.
Third Edition. F. A. Davis Company, 1901.

The first edition of this book made it a well-known work, and one eminently deserving the great popularity which it attained. The second edition was published in 1896. This third edition now appears and contains additions and revisions which embody the best modern surgical teaching. It shows a thorough and careful revision, together with the addition of two entirely new chapters. One of these is on Degeneration, and the other on Blastomycetic Dermatitis. Many new and original illustrations have been added. This chapter on Degeneration finds a very proper place in a work of this sort. It is a subject with which the student has all too little acquaintance.

In discussing the subject of inflammation, the author takes up successively the different anatomical elements which enter into its phenomena, and discusses their relations to this pathological process. The symptoms are described in their relation to these

things; and then a consideration of the various types of inflammation and their treatment. The author says that "inflammation *per se* is no disease, but an effort on the part of the organism and the tissues affected to eliminate or render harmless the primary cause."

The chapter on Pathogenic Bacteria presents the subject in its surgical light. The author makes the mistake to give the botanists more than is their due of credit in the development of this science: they are just the people who missed the great opportunity of seizing upon and developing this branch of botany. By their own default, they permitted it to go into the hands of the pathologists and physicians and grow into a special department of natural science. A chemist recognized its importance while they were classifying cryptogams. They worked among their own well cultivated fields while a vast arid tract in their very province was invaded by foreigners, cultivated to a state of wonderful fertility, declared free and independent, called Bacteriology, and entered into alliance and annexation with Pathology,—all while they were counting the thumbworn petals of their flowers.

This chapter on bacteria presents the subject in most admirable style, entering into the practical biology, the consideration of the ptomaines and toxins, and the questions of infection and immunity. Two full chapters are given to the discussion of supuration, septicæmia, bone inflammations, and infections of the brain and cord are fully and well presented. Concerning erysipelas, the author makes this interesting observation, that "small wounds are more frequently attacked by erysipelas than large wounds, because the latter receive more careful attention, and are, as a rule, subjected to more rigid antiseptic treatment." He lays especial stress upon the dangers of mixed infection in this disease. Uncomplicated erysipelas, he says, is a disease which tends to spontaneous recovery, and seldom proves fatal, even if it is allowed to pursue its own course, unaided by any local application or internal medication.

The chapter on Surgical Tuberculosis shows the author at his best. He begins with the history of the microbic origin of tuberculosis, describes the life and habits of the tubercle bacillus, gives the approved methods for its discovery and study, and elaborates its pathogenic properties. The anatomy and histogenesis of tubercle are fully presented. A chapter is given to the clinical forms of tuberculosis and the principles of treatment. In another chapter is discussed tuberculous disease of the various organs and regions. The author pleads for early operation upon tuberculous lymph nodes. "Early operative interference is as necessary in the treatment of tubercular adenitis as in the treatment of malignant tumors, and holds out more encouragement, so far as a permanent cure is concerned." Here is another example of good surgery: "The surgeon should aim to remove, as nearly as he can, all of the infected glands in one continuous string."

The chapters devoted to tuberculosis of the bones and joints are of the same high standard of excellence as the author's previous works upon this subject.

The illustrations are good. The defect in the work is the absence of the consideration of tumors. This defect the author has made good by the publication of a separate work upon the subject.

JAMES P. WARBASSE.

TUMORS, INNOCENT AND MALIGNANT: Their Clinical Features and Appropriate Treatment. By J. BLAND SUTTON, Surgeon to the Chelsea Hospital, etc. New Edition. Pp. 566. Cassell & Company, 1901.

Exhaustive criticism of a previous edition has already covered the general plan and scope of this book, which has in part for its object that most desirable end of reducing the terminology of oncology to a more concrete and rational form by eliminating a large number of descriptive names whose claim to existence rests only on venerability; and a systematic classification of the

varieties of tumors into genera and species. The main portion of each article is descriptive, treatment being indicated rather than detailed.

If any one part is deserving of special mention, it would seem that the chapters on sarcoma and carcinoma were especially interesting, possibly on account of the recent investigations of Gaylord. The author points out the possible parasitic origin of carcinoma, but does not treat of the question *in extenso*.

A few changes along the lines of more recent discovery and opinion are noticeable, especially the author's altered notion of the malignancy of dermoids, a class of tumors which he now thinks are unquestionably benign. His frequent references to comparative pathology are interesting and instructive, and his example in this respect might well be more generally followed. A fault, at which we may be permitted to hint, is the lack of a brief summary of the main symptoms and characteristics of each variety for purposes of differential diagnosis.

HENRY GOODWIN WEBSTER.

INTERNATIONAL CLINICS. Edited by HENRY W. CATTELL, A.M., M.D. Volume II, Eleventh Series, 1901. Philadelphia: J. B. Lippincott Company, 1901.

This volume covers sections on therapeutics, medicine, neurology, surgery, obstetrics and gynæcology, pediatrics, pathology, diseases of the eye, laryngology, and a lexicon of the newer medical words.

The section on surgery contains reports of cases from the clinic of Dr. Deaver at the German Hospital in Philadelphia, and a paper on Splenectomy by Dr. Wathen, of Louisville.

The reports of Dr. Deaver's clinic are of especial value to the general practitioner. The manner of these reports is excellent, and gives a word picture of the case and the procedures of the surgeon. The history of the case is recited, the examination is made, the operation is entered upon and described as it proceeds

from the anæsthetic to the dressing, and the reader is made to feel the presence of the surgeon and patient. Dr. Deaver's style is clear, his descriptions are graphic, and his surgery excellent. He deals with such subjects as litholapaxy, osteomyelitis, tuberculosis of the testicle, hydrocele, inoperable myxosarcoma of the shoulder, inguinal hernia, sarcoma of the upper jaw, ununited fracture of the femur, rectal fistula, and hip-joint amputation for recurrent sarcoma. In all his dealing with these subjects he shows his talent as a medical teacher.

Another valuable feature of the book is the index of the newer medical words, giving their definition and pronunciation.

The general scope of this work we have already referred to. It is a valuable publication. This particular volume is one of the best from the surgical stand-point.

JAMES P. WARBASSE.

ANNUAL AND ANALYTICAL CYCLOPÆDIA OF PRACTICAL MEDICINE. By CHARLES E. DE M. SAJOUS, M.D., and One Hundred Associate Editors. Vol. vi. Philadelphia: F. A. Davis Company, 1901.

This sixth volume of Sajous's Cyclopædia completes the work in accordance with the plan announced with the first volume in 1898, thus, as the result of very great diligence and promptness, the successive volumes of the work have appeared within a period of three years. Previous mention of the work, as its volumes have from time to time been issued, has been made in the *ANNALS OF SURGERY*. The favorable comment which was called forth by the first volume has been deservedly continued to the succeeding ones. The work as a whole, as it now stands, deserves high praise. Its special feature is that with a practical and clear presentation of all subjects pertaining to medicine and surgery there is coupled a special statement of the contributions to the subject which the literature of the last three years has contained. Thus the general

practitioner is at once put in touch with the literature of any particular subject, while to writers and investigators are given references which they may consult further if they desire. The present volume opens with a good article by Adler, of Philadelphia, on Diseases of the Rectum and Anus; Diseases and Injuries of the Spine are treated by R. H. Sayre, of New York. The Surgery of the Stomach and Intestines by Keen and Tinker, of Philadelphia, Surgical Diseases of the Skin, Syphilis, Diseases of the Tendons, Tetanus, Diseases of the Tongue, of the Tonsils and Pharynx, Tuberculosis, Tumors, Diseases of the Urinary System, Diseases of the Uterus and its Adnexa, and of the Vagina and Vulva, Wounds, are other articles of surgical interest contained in this volume, in each case by a recognized authority on the particular subject. A General Index at the close of the volume assists the reader in locating the articles in which a given subject is treated or indirectly considered.

LEWIS S. PILCHER.

A TEXT-BOOK OF PHYSIOLOGICAL CHEMISTRY. By CHARLES E. SIMON, M.D. 8vo. Pp. 453. Philadelphia: Lea Brothers & Company, 1901.

The handy size of this book well adapts it for use as a text-book in the lecture-room and as a guide in the laboratory. It is practical, brief, condensed, and yet comprehensive in its treatment of the facts of physiological chemistry. The first part of the work is devoted to a study of the origin and chemical nature of the three great classes of food-stuffs, and the products of their decomposition. Next, the processes of digestion, resorption, and excretion are dealt with. In a third part the elementary tissues and the various organs of the animal body are analyzed. The book is as valuable for reference for the practitioner as it is for study by the medical student.

LEWIS S. PILCHER.

THE TECHNICS OF NEPHROPEXY,

AS AN OPERATION PER SE, AND AS MODIFIED BY COMBINATION
WITH LUMBAR APPENDICECTOMY AND LUMBAR
EXPLORATION OF THE BILE PASSAGES.¹

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NEPHROPEXY (*νεφρος*, a kidney; *πηνυμι*, *πηνω*, I fix), or the operative fixation of a movable kidney, first performed by Hahn in 1881, has since that date gone through a process of evolution and changes in technics until now it may fairly be claimed to be a perfectly satisfactory procedure. Within the past three years, in the practice of the writer at least, decided modifications, or rather amplifications, of the technics of nephropexy have been called for. These additions have been necessitated by increasing knowledge concerning the relations between movable right kidney, appendicitis, and diseased conditions of the gall-bladder and bile ducts.

NEPHROPTOSIS AND APPENDICITIS.

The relations of movable right kidney to appendicitis, first pointed out and elucidated by the writer (*c*) in 1895, and more firmly established in his subsequent publications on the same subject (*f*, *h*), have demonstrated the necessity of removing the vermiform appendix in many patients who need operative fixation of a loose right kidney. The simultaneous removal of the diseased appendix and anchoring of a loose

¹ Read before the Medical Society of the State of New York, October 15, 1901.

right kidney through one and the same lumbar incision, as first performed by the writer (*e*), appears a natural corollary, deducible without strain from the proposition that both operations are frequently called for in the same individual.

My first publication (*c*) on the relations of movable kidney and appendicitis attracted little or no attention. Following the appearance of my second article (*e*), in 1898, Hadra both expressed his disbelief in the causal connection between movable right kidney and appendicitis and considered the lumbar operation of both at one sitting as too dangerous. He does not appear, however, to have even attempted the operation. Tuffier (*b*), while not actually disputing the frequent association of movable right kidney and appendicitis, criticises my explanation of the relations between the two conditions, believing that they are both due to the same "insuffisance physiologique des tissus."

McRae, Lanphear, and Gibbons accept my views on the relations of movable right kidney and appendicitis, and follow me in the practice of lumbar appendicectomy and right nephropexy at the same sitting. McRae reports two cases of simultaneous operation, through a lumbar incision, upon kidney and appendix. Lanphear says that he has been led to invariably remove the appendix when operating on the kidney, and illustrates lumbar appendicectomy by excellent photogravures. J. F. Baldwin, of Columbus, Ohio, writes me: "I invert the appendix constantly through the lumbar incision made for any examination of the kidney. I can recall but two instances in which I have failed to reach the appendix through the lumbar incision." Gibbons, speaking of the treatment of movable kidney, says, "Operate, and at the same time remove the appendix."

Lumbar appendicectomy is performed by opening the peritoneum to the outer side of the ascending colon. The appendix is found by following the longitudinal muscular bundles or bands of the colon downward to the cæcum where they join at the root of the vermiform process. The latter is delivered into the wound and either inverted entire into the

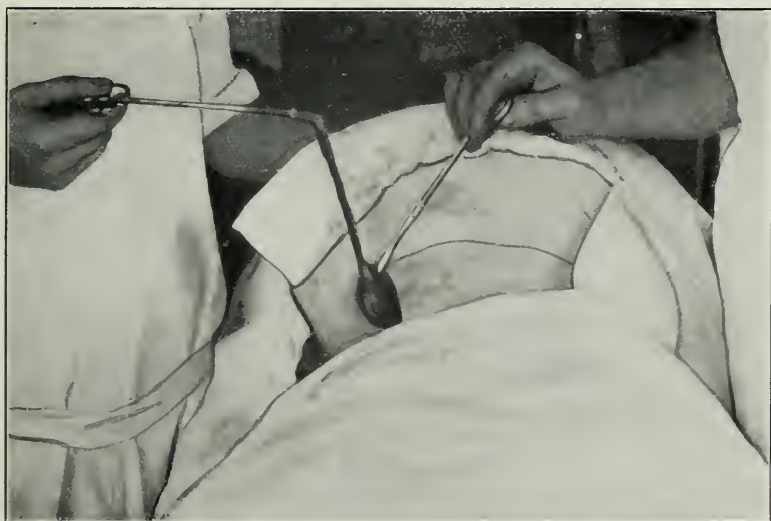


FIG. 1.—Lumbar appendicectomy. Appendix and cæcum delivered through lumbar incision. Upper forceps holds free tip of appendix; lower forceps grasps the ligated stump of excised meso-appendix. Appendix ready for inversion or excision.

caput coli, after tying off the meso-appendix, or else amputated and the stump treated according to the predilection of the operator, my own choice being inversion of the stump without ligation (Fig. 1).

Simple as the procedure seems to be, and as it occasionally is, the average lumbar appendicectomy has proven in my experience a not too easy operation. In the fifty-six cases in which I have attempted it, I have failed four times. In two cases the appendix could not be found, in a third it was impossible to deliver it sufficiently far into the wound to operate upon it, and in a fourth case the presence of pus in and around the appendix led me to abandon the posterior operation and to remove the appendix in the usual way through an anterior incision. In the fifty-two lumbar appendicectomies which I have performed, the appendix was removed by inversion in forty-six cases and by excision in six cases.

The lumbar route for the removal of the appendix is never indicated except when the operation is performed as a concomitant to right nephropexy. Under all other circumstances the usual anterior operation for appendicitis should be the method of choice.

NEPHROPTOSIS AND DISEASES OF THE BILE PASSAGES.

As regards the associations existing between movable right kidney on the one hand, and the various diseases of the bile passages, cholelithiasis, cholecystitis, pericholecystitis, etc., on the other, clinical and post-mortem observations, as well as experience gained at the operating table, point to their frequency and importance. Litten, as early as 1880, recorded a case in which frequent attacks of deep jaundice were produced by pressure of a movable right kidney upon the common bile duct. He also quotes Urag as finding at autopsy a right kidney displaced beneath the liver and adherent to the gall-bladder and transverse colon. Riedel calls attention to the frequent coexistence in women of inflammatory processes of the internal genital organs with movable kidney, and to complication of the latter with gall-stones and inflammation

of the vermiform appendix. R. Wolff, in reporting the cases of Rose, attributes the icterus present in two of them to movable right kidney, and Gallant has put on record a clinical case of movable right kidney giving rise to symptoms of gall-stones.

Experience gained at the operating table is still more decisive and convincing as regards the frequency and clinical dignity of the association of movable kidney with diseased conditions of the bile passages. The first recorded cases of operation upon the liver performed simultaneously with nephropexy which I have been able to find are those of Tillmanns and Von Tischendorf, both done in 1887. Tillmanns, after an anterior exploratory cœliotomy, successfully operated upon an echinococcus cyst of the liver and performed right nephropexy through one and the same lumbar incision. Von Tischendorf, cited by Frank, performed right nephropexy and an operation for gall-stones through an anterior abdominal incision.

Of the reported cases in which surgical interference showed the concomitant existence of movable kidney and disease of the bile passages, the kidney alone was operated upon in some, the biliary passages alone in others, while in perhaps one-half of the total number both nephropexy and operation upon the bile passages were performed.

Lobstein reports a death from gall-stones two months after nephropexy. In the case of White, repeated attacks of jaundice, caused by pressure of a movable right kidney, were permanently cured by lumbar nephropexy performed by Lane. Maclagan and Treves report three cases of lumbar nephropexy in which the upper pole of a movable kidney was found pressing upon the cystic duct, causing all the symptoms of gall-stones. Relief of all these symptoms followed nephropexy. Lawrie and Holmes have recently put on record practically similar experiences of cure of pronounced gall-bladder and liver symptoms, including jaundice, by right lumbar nephropexy. In Holmes's case the healthy condition of the liver and bile passages was verified through an anterior abdominal incision just prior to nephropexy. Cordier, through

an anterior abdominal incision, established a diagnosis of movable right kidney and dropsy of the gall-bladder without cholelithiasis. Lumbar nephropexy, without any operation upon the biliary passages, was followed by the disappearance of all gall-bladder symptoms.

Reboul and Lejars report two practically identical cases. In both cases a lumbar incision was made for the purpose of operating upon a supposed kidney tumor. The tumor in one case proved a distended gall-bladder with gall-stones, in the other a pycholecystitis. The gall-bladder in both instances was opened and emptied through the lumbar incision, and drainage effected by sewing the edges of the incision in the gall-bladder to the lumbar wound. Walker reports a case of movable kidney complicated with a distended gall-bladder and gall-stones, in which he performed cholecystotomy through an anterior abdominal incision, not operating upon the kidney.

Wendel gives a not very clear description of a case of floating gall-bladder and kidney, complicated by cholelithiasis with perforation of the gall-bladder, upon which he operated through an anterior abdominal incision. The floating kidney was discovered "to inside of gall-bladder." Cholecystectomy was first performed, after which the kidney was dissected from the colon and placed in its normal position without suture. Four weeks later the kidney was found solidly fixed. Hawkins relates an interesting case of hydronephrosis and cholelithiasis, both of which conditions he operated upon simultaneously through a lumbar incision, performing nephropexy in addition. The kidney was opened first and its pelvis drained, after which the gall-bladder was punctured from the rear and thirty-five stones evacuated. The patient was discharged eighteen days after operation. Tuffier, Morris, Ferguson, Paul, and Oviatt each report a case of operation upon the kidney and bile passages of the same patient. Oviatt operated at two sittings, the others did all their work at one sitting. Tuffier (*a*) performed nephropexy through a lumbar incision and choledochotomy through an anterior incision, and as an outcome of this experience proposed the lumbar incision for exceptional cases of choledochus stone and gall-bladder calculi. H. Morris (*b*), while performing nephropexy, discovered a calculus in the cystic duct by palpation through the lumbar incision. The gall-stone was removed and the gall-bladder was emptied through an anterior

abdominal incision; after which the nephropexy was completed through the original posterior incision. In Oviatt's case distention of the gall-bladder followed a nephropexy, and was operated upon at a second sitting through an anterior incision. A. H. Ferguson did a lumbar nephropexy and incised the gall-bladder through the lumbar wound, evacuating 114 stones, then opened the abdomen anteriorly to establish drainage of the gall-bladder. Paul, finally, in a case of cholelithiasis and right movable kidney and hydronephrosis, operated from front and rear, performing cholecystotomy and nephropexy at the same sitting. He notes that the gall-bladder and contained stone presented in the posterior incision.

In very recent times the conviction is gaining ground among a number of clinical observers, including the writer, that there exists an intimate association between movable right kidney on the one hand, and cholecystitis, cholelithiasis, and their sequelæ on the other. Thus in four successive nephropexies recently performed by the writer, lumbar exploration demonstrated the presence of gall-stones in two of the patients and of chronic cholecystitis and pericholecystitis in the other two. Many, in this association, see the relation of cause and effect, holding the movable right kidney responsible for the disturbances in the biliary tract. Whether this be the full truth or not, the facts remain that the two affections often coexist, that both may require treatment in the same patient, and that the only way to gain an absolutely unquestionable knowledge as to the actual condition of the gall-bladder, bile ducts, and adjacent parts is by direct exploration.

The writer's work in this direction, embracing some thirty-odd cases of lumbar exploration of the bile passages, has demonstrated to him that direct examination of the gall-bladder, and more especially of the bile ducts, may, in the average case, be made just as satisfactorily, if not rather more so, through a right lumbar nephropexy incision as through the usual anterior incision of the abdominal wall. The exploration begins with the duodenum and proceeds forward

along the common duct to the cystic and hepatic ducts and the gall-bladder.

As regards the feasibility and advisability of practising, in any large proportion of cases, operative procedures upon the gall-bladder and bile ducts through a lumbar incision, is a different and as yet unsettled matter.

The writer, in one of his cases, was able to deliver the gall-bladder through a right nephropexy incision to well up near the skin of the back. The gall-bladder in this case contained a solitary stone; otherwise it appeared healthy, as did the bile ducts. As none of the patient's symptoms appeared referable to the gall-bladder, the stone was not removed, although it would have been a very easy matter in this particular instance to do either cholelithotomy or cholecystectomy through the lumbar incision. The patient recovered full health after right nephropexy performed a year and a half ago, and the gall-stone has given her no further trouble. The same course was pursued in the case of another patient, in whom lumbar exploration detected the presence of four or five stones in the gall-bladder. The right kidney was anchored and a diseased appendix was excised through the lumbar incision. These operations were performed more than a year and a half ago, and the patient has remained well and free from all symptoms without operation on the gall-bladder.

In this case, however, as well as in other cases in which lumbar exploration showed cholelithiasis, cholecystitis, pericholecystitis, etc., it would have been practically impossible through the lumbar incision to deal surgically, in a satisfactory manner, with the diseased conditions found in and about the bile passages.

Two patients in whom disease of the bile passages was ascertained through the lumbar incision were operated upon for gall-stones through the usual anterior incision, one at the same sitting with the posterior operation and one at a subsequent sitting, when the truth of the statement contained in the preceding sentence could be readily verified. From one of these two patients the appendix was excised through the lumbar incision, and some fifty gall-stones were removed through the usual anterior incision at the same sitting, the slightly movable kidney not being operated

upon. In the other patient bilateral nephropexy and lumbar inversion of the appendix were performed at one sitting, while at a second operation, performed seven months later, a gall-stone impacted in the common bile duct was successfully extruded by manipulation into the duodenum through an anterior abdominal incision. Two years have elapsed since operation in both cases and both patients remain well.

The near future may, perhaps, bring us a modification of the lumbar nephropexy incision, by means of which we will be able to apply such surgery as may be called for by the condition of the bile passages before we anchor the kidney.

In view, then, of the desirability, in the interests of the patient, of knowing the exact condition of the biliary system and of adjacent viscera, and the ease, certainty, and safety with which such knowledge may be obtained while anchoring a right kidney, I now very frequently practise exploration through the lumbar incision on the occasion of a combined right nephropexy and lumbar appendectomy. It is only necessary to enlarge the peritoneal opening required for the appendectomy sufficiently to admit of free access to the gall-bladder, bile ducts, liver, duodenum, pancreas, pylorus, etc. And even when appendectomy was neither called for nor practised on the occasion of the performance of a right nephropexy, I have in some cases, when exploration of the bile organs seemed indicated, deliberately opened the peritoneum for the sole purpose of making such exploration. In other instances, I have contented myself with exposing the peritoneum at the bottom of a right nephropexy incision and with palpating the gall-bladder, gall-ducts, and under surface of the liver, the unopened peritoneum alone intervening between the palpating fingers and the palpated organs. It is astonishing how much positive information, especially of a negative character, may be without more ado thus obtained.

In view, then, of the above considerations, I find it unnecessary and uncalled for to go as far as F. C. Ferguson, who advocates preceding lumbar nephropexy by an anterior abdominal incision for the purpose of exploring the gall-

bladder, the appendix, and the other kidney. My views on exploration of the other kidney I have already set forth at length in a paper (*d*) published in 1898.

HISTORY OF NEPHROPEXY.

Hahn performed the first nephropexy on April 10, 1881, and must be regarded as the father of the operation. The only dissent to this statement comes from Lanphear, who writes: "To an American belongs the credit of designing the operation of fixation. In 1874, Greenville Dowell, of Galveston, made a rude attempt to suture the loose kidney to the posterior wall of the abdomen by the introduction of the seton. This was a failure. . . ." Smyth gives the following account of Dowell's case. It makes interesting reading from several points of view, and will enable the reader to judge for himself of the value of Lanphear's contention.

"Mrs. C., a native of Ireland, thirty-five years of age, of medium stature, delicate build, dark complexion, fifteen years married, no children, was brought to me by Dr. Greenville Dowell, of Galveston, in April, 1879.

"She gave the following history of her case:

"Eight years previously, she began to be afflicted with a pain in her right side. Shortly after the commencement of this pain, she discovered a tumor in her right side, to which she attributed her suffering. She tried various remedies for the relief of her pain, without any benefit. In 1873, Drs. Wilkinson and Calloway, of Galveston, where she and her husband resided, performed on her the usual operation for ovarian tumor, without removing the cause of her trouble. The year following, her suffering still continuing, Dr. Greenville Dowell, believing that the pain was owing to the mobility of the tumor, passed a large curved needle with a tape-seton through the walls of the abdomen, and through the tumor, with the purpose of causing adhesion, so as to prevent the moving of the tumor in the abdomen. Some hæmaturia was noticed after this operation. The seton was retained for three months, and gave some relief. At the end of that time the tape broke and came away. The seton caused a persistent offensive discharge from the wound."

"Six months afterwards, Drs. Calloway and Penny—Dr. Dowell being absent from Galveston—attempted twice to reintroduce the seton; but, on both occasions, broke their needles, leaving the broken ends in the abdomen."

"Two months later, Dr. Dowell introduced the seton again, but without giving as great relief from pain as in the first instance."

"From continual suffering after this, her mind gradually became im-

paired, and in June, 1875, she was taken to the State Lunatic Asylum, in Austin, Texas, where she remained for two years. During her confinement there, the second seton came away. Her husband, in the meantime, having removed to New Orleans, received a communication from Dr. D. R. Wallace, the Superintendent of the Asylum, of the fact that his wife had recovered sufficiently to return home; and in November, 1877, she came alone to New Orleans."

"On her arrival there she applied to the Charity Hospital, when Drs. Pratt and Miles, the surgeons in charge of the institution, told her that the tumor was a floating kidney."

"She says this is the first intimation she received that it was her kidney that was the cause of her suffering. The medical officers of the Charity Hospital did not, however, suggest the propriety of surgical interference."

"At the time of the meeting of the State Medical Association in New Orleans, in the month of April, 1879, she was called on by Dr. Dowell, who, finding her anxious for a surgical operation, brought her to Dr. Smyth, with a request that he would attempt the removal of what he believed at this time to be the *fons et origo mali*—the floating kidney."

Right lumbar nephrectomy was successfully performed by Dr. Smyth on June 3, 1879.

"The kidney removed was found to be of normal size, but to be scarred with a deep cicatrix, extending from the inferior and outer edge, obliquely up and out, and apparently through the pelvis. The length of the cicatrix was about two inches and a half. It was evidently the result of the seton introduced, which had cut its way completely out of the organ."

"The operation has been followed by complete recovery; and the patient no longer complains of the trouble afflicting her, on account of which it was undertaken."

Hahn was followed in Germany by Kuester, Esmarch, and Delhaes, who each reported a case of nephropexy in 1882. The first nephropexy in Italy was performed by Bassini on July 27, 1882; the first in America by Weir in November, 1882; the first in England by Newman (*a*) on March 29, 1883; the first in France by Bazy on August 18, 1885. Kuester is credited by Lindner with the performance, on October 10, 1883, of the first bilateral nephropexy at one sitting.

Owing mainly to the large proportion of failures to permanently anchor the kidney in the earlier cases, the operation was slow in coming into favor. With the evolution, however, of improved technics, and with a better understanding of the scope of the operation, as well as the establishment of clearer

indications for its performance, nephropexy has within the past decade shown increasingly satisfactory results, both from the operative view-point and therapeutically. Properly applied in suitable cases it forms one of our most potent measures for the relief of human suffering.

The frequency, practical importance, and pathological dignity of movable kidney are beginning to be recognized by the profession in general. Surgeons of the first rank, who but a few years ago decried the operation of nephropexy, are now most active in its performance and most prolific contributors to the rapidly increasing literature of movable kidney, a literature which already embraces some eight hundred memoirs, journal articles, and books.

TECHNICAL CONSIDERATIONS.

Blake writes of nephropexy as a minor kidney operation. To this the writer, for one, must dissent. No operation with a mortality between 1 and 2 per cent. can in any sense be classed as a minor procedure, and personally I consider a well and accurately performed nephropexy a more difficult surgical procedure, and one requiring more time for its performance, than the average nephrectomy. Thoroughness in the details of nephropexy is considered by R. Wolff and others as essential to obtaining a uniformly satisfactory anatomical result of the operation.

The performance of nephropexy brings the surgeon face to face with a mechanical as well as a surgical problem, the most successful solution of which calls for the exhibition of the highest type of both mechanical and surgical ingenuity and skill. Nearly every surgeon with longer experience in the performance of nephropexy has from time to time varied or modified, to a greater or less extent, his technics of the operation. The technics of nephropexy have thus undergone a process of evolution in the practice of the majority of those who have performed the operation for years. Following the general laws of evolution, this evolution in the technics of nephropexy has been marked by occasional backward steps,

or retrogressions, as well as by the revival, more especially on the part of new-comers in the field, of older methods long ago tried and found ineffectual. In working out the technical history of nephropexy, the writer has therefore endeavored as far as possible to quote from the most recent publications of those who have written of the operation.

The problem presented in performing nephropexy is briefly how to establish a new permanent anchorage for a movable kidney without damage, or with the least possible damage, to the organ itself, to surrounding parts and to the patient. The consideration of this problem involves a study of the best route of approach to the organ, of the preparation of the kidney for anchorage, of the preparation of the parts to which it is to be anchored, and of the method of anchorage.

THE INCISION.

The lumbar incision is the one which has found favor with the great majority of surgeons in the performance of nephropexy. This seems but natural in view of the fact that the kidney is invariably anchored to the tissues posterior to it, even by those who operate through an anterior abdominal incision.

The only exception to this rule which I have found, and at the same time, probably, the first intraperitoneal or transperitoneal nephropexy, is recorded by Rosenberger, who, through a large incision in the right lateral wall of the abdomen, sewed the kidney to the peritoneum. Franks and Reed also operate transperitoneally through an anterior abdominal incision, passing silk sutures through the kidney and out at the back, where they are tied. Montgomery (*a*) records a transperitoneal nephropexy, with failure to anchor the kidney, followed later by successful lumbar nephropexy.

F. C. Ferguson and McArthur, finally, advocate nephropexy by combined anterior and lumbar incisions. The latter opens anteriorly, makes a pocket for the kidney by slitting through the anterior layer of the lumbar fascia and transversalis aponeurosis, and pockets the lower end of the kidney

posterior to these structures, which he closes around the kidney with sutures.

With the few exceptions just noted all operators prefer the lumbar incision and extraperitoneal operation and fixation. Jonnesco, Kuester, Lobstein, and a few others run the incision parallel to the twelfth rib. The vast majority, however, of those who operate by the lumbar route employ the classical incision running along the outer margin of the erector spinæ from the twelfth rib to the crest of the ilium. The incision should leave the sheath of the erector spinæ unopened, separating but not severing the fibres of the latissimus dorsi (Fig. 9), and deeper down opening the sheath and laying bare the fibres of the quadratus lumborum along the entire extent of its outer margin. Incision or blunt penetration of the transversalis fascia along the direction of its fibres brings us to the fatty capsule of the kidney and completes the approach to the organ.

The just outlined method of incision constitutes an extension or application to the lumbar region of the principle involved in the intermuscular incision for appendicitis, for the publication of which, in 1894, surgeons and their patients owe a debt of gratitude to McBurney. Wilcox (*b*) in 1896, Abbe in 1897, and Robson in 1898, applied the principle of McBurney to incisions made for exploration and work upon the kidney and ureter. Their incisions, practically identical in location, beginning at a point just within or near the anterior superior spine of the ilium, extending thence upward and outward, and in the deeper parts of the wound bluntly separating the muscular fibres of the external and internal oblique and transversalis, can scarcely, however, be classed as lumbar incisions.

Ready access to the kidney, after completion of the lumbar incision, may prove a difficult matter in the presence of certain conditions of the osseous skeleton. In persons of short stature the lower edge of the twelfth rib and the crest of the ilium may be so near to each other that the lumbar space between them may be narrowed down to three centi-

metres, or even less in the extremest cases, even after hyper-extension of the lumbar region by means of postural devices.

A more oblique incision, beginning a little internal to the attachment of the erector spinæ to the twelfth rib and terminating a little outward of its insertion into the crest of the ilium, will aid in giving us more room.

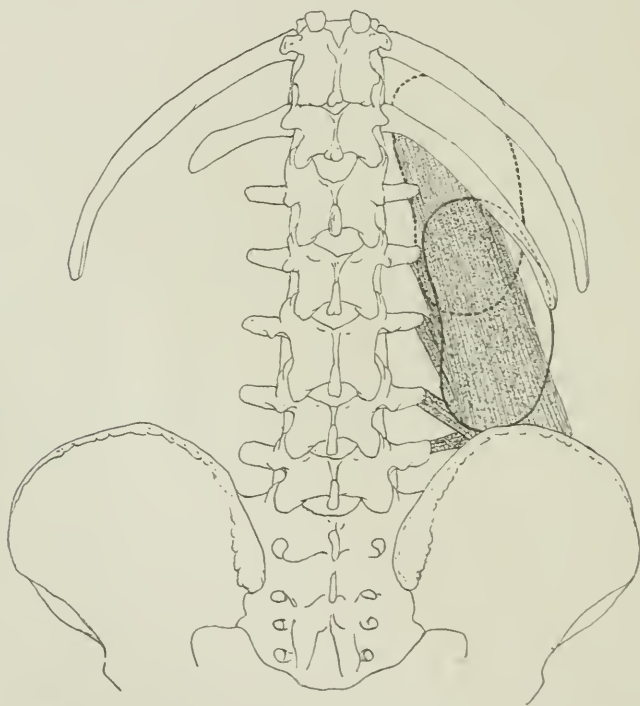


FIG. 2.—Modified from Recamier, to show short, straight, left twelfth rib, and long, oblique, right twelfth rib. Dotted outline shows normal height of kidney; dark outline height at which the kidney is anchored in author's method of nephropexy.

The difficulty or ease of any lumbar operation upon the kidney, nephropexy included, depends very materially upon the degree of obliquity of the last rib and upon the endowment of the patient by nature with long or short twelfth ribs. A long twelfth rib and increased obliquity of the ribs generally coexist, and go hand in hand in rendering difficult approach

to the kidney from behind; a fact long recognized and well illustrated by Recamier, Wolkow and Delitzin, and others. In performing bilateral nephropexy the writer has four times encountered a short, straight twelfth rib on one side and a long oblique twelfth rib on the opposite side of the same patient (Fig. 2).

It was probably difficulties arising from these sources which suggested to several operators resection of the twelfth rib to overcome them. Sulzer quotes De Paoli and Duret as practising resection of the twelfth rib to gain more light. Tillmanns, after following their example in one case to enable him to anchor the kidney in more nearly its normal position, condemns resection of the rib in performing nephropexy; and Wolkow and Delitzin, as a result of their extensive and important work upon the cadaver, conclude that resection of the ribs is to be avoided in nephropexy. The writer on one occasion, while performing nephropexy, found and resected a jointed free end, some three centimetres in length, of the twelfth rib. This was done, however, solely for the purpose of doing away with what was considered an abnormality.

Personally, I have been able in all my nephropexies and other operations upon the kidneys to overcome the difficulties connected with great proximity of the twelfth rib and ilium, or with a long and oblique twelfth rib, by a very simple device. This consists in nicking the outer margin of the quadratus lumborum, at or very near its insertion into the crest of the ilium, to a greater or less degree according to the demands of the situation, an expedient which I have availed myself of some two or three dozen times. I have never found it necessary to extend the lumbar incision downward and forward upon the abdomen, or make a trap-door approach to the kidney by two incisions at right angles to the first incision, one at the upper and one at the lower end of the latter, a procedure I have now and then seen practised by this or that surgeon upon the slightest provocation.

One important matter in connection with the incision for lumbar nephropexy cannot be insisted upon too strongly, al-

though it is still disregarded by most operators. Hahn, quoted by Frank, noticed post-operative dysæsthesia of varying degree in the gluteal region of the side operated upon in a number of his patients. Treves speaks of "kidney pain" in the outer side of the thigh and in the heel as not uncommon after the operation, and says that it may be long-abiding. Weir noted hyperæsthesia along the course of the iliohypogastric nerve as following his first nephropexy. The writer observed pains and dysæsthesiæ of various degree along the distribution of the iliohypogastric nerve after several of his earlier nephropexies. Possibly every operator of larger experience has now and then had a similar experience.

Jonnesco, in an off-hand manner, attributes these pains to permanent sutures. All other writers who comment upon the matter, however, correctly attribute these disagreeable consequences to injury or section of the iliohypogastric or ilio-inguinal nerves, or of both. Tillmanns draws the nerve to one side to protect it from injury, and Rose, cited by R. Wolff, and Edebohls (*b*) follow the same practice. The latter reports three cases in which the nerve ran directly across the middle of the field of work, absolutely preventing the completion of the operation, in which he divided the nerve, completed the operative work upon the kidney, and sutured together the divided ends of the nerve before closing the wound. He advocates this procedure in all cases in which the nerve cannot be drawn to one side or the other out of the way, or whenever it may have been accidentally divided.

PREPARATION OF THE KIDNEY FOR FIXATION.

So much for the incision. Our next concern is with the preparation of the kidney itself for fixation. This anchoring of the kidney is effected by means of sutures by the large majority of surgeons. A few practise nephropexy without sutures; of their methods we will speak farther on, confining ourselves for the present to a consideration of suture methods.

Hahn, in his first cases, and those who immediately followed him in the performance of the operation, suspended the

kidney by means of the fatty capsule alone, which, with or without resection of part thereof, they sutured to the external wound. The relapses, however, which speedily followed proved the inadequacy of the fatty capsule to the task imposed upon it, and soon led Hahn himself to improve upon his methods. As far as my knowledge goes, every operator of longer experience who has ever performed nephropexy by anchoring the fatty capsule alone has abandoned the method. It is a curious phenomenon, therefore, to find Andrews, as late as 1900, endeavoring to revive this obsolete method under the fanciful title of "the reefing operation."

While experience, therefore, has proven that no amount of surgical ingenuity and skill can render the fatty capsule alone capable of permanently sustaining a movable kidney, quite a number of operators still make use of the fatty capsule, in various ways, as an adjuvant to other and better ways of anchoring a movable kidney. Thus, Bazy sews the fatty capsule and the capsule proper, while Angerer and Newman (*b*) pass their sutures through fatty capsule, capsule proper, and kidney parenchyma, none of the three opening the capsule proper. Noble makes a pad of the fatty capsule, which he crowds beneath the lower pole of the kidney as a support to the latter.

For my own part, my operative experience has convinced me that the idea of deriving any aid whatsoever from the fatty capsule in supporting a roaming kidney is fallacious, and that its retention to any considerable amount facilitates the reacquisition of mobility by the kidney we have anchored. For the past three or four years, therefore, I have made it a practice to remove the fatty capsule in its entirety in performing nephropexy, and I note that Myles and one or two others, probably influenced by the same considerations, have adopted the same practice.

The unopened capsule proper of the kidney, the fatty capsule being resected to a greater or less extent, or simply crowded aside, is depended upon for fixation by quite an array of operators; although Jonnesco has proven experimentally

that capsule adhesions are not nearly so strong as those formed when the kidney is rawed. Some believe, with Kellogg, that passing the suture immediately beneath the unopened capsule proper, between it and the cortex, secures a sufficient hold upon the kidney. The vast majority of those, however, who operate without opening the capsule proper pass their sutures both through the capsule proper and more or less deeply through the kidney substance. Among these are Delhaes, who is credited by Kuester with being the first to pass sutures through the kidney parenchyma, Duret and Guyon quoted by Vanneufville and Mayolle, Keen, Wilcox, Hildebrand, Treves, Albarran (*b*), R. W. Johnson, Kuester, Wallace, H. Morris (*c*), and Goelet. A few of these operators scratch the outer surface of the capsule proper to produce irritation prior to sewing fast the kidney.

A third way of preparing the kidney for attachment is by decortication, or denudation of the kidney cortex by stripping off the capsule proper to a greater or less extent, and in different figures and arrangement, to suit the fancy of the particular operator. Rose, quoted by R. Wolff, and Lobstein remove the entire capsule proper. I have unintentionally done the same thing in a few of my nephropexies; and it has appeared to me that the kidneys so treated remained, if anything, more immovably anchored than on the average. I see no objection to complete decapsulation of the kidney, which, indeed, I regard as the essential feature in the surgical treatment of chronic nephritis or Bright's disease as advocated by me (*i, k*), except that in performing nephropexy after my present method I utilize the stripped-off capsule proper in anchoring the kidney.

It is scarcely worth while to describe in detail the various forms, sizes, and shapes of flap of the capsule proper preferred by different surgeons. A more practical division of those who denude the kidney substance itself in performing nephropexy is into those operators who anchor the kidney by capsule suspension only, not piercing the parenchyma of the organ, and into those who penetrate with sutures both capsule proper and

parenchyma. Lane, Selmi, A. B. Johnson, Baldwin, Montgomery (*b*), and R. T. Morris (*b*) have each given us ingenious capsule fixation methods without suture of the parenchyma; the mechanical shortcomings of Morris's method, however, being pointedly criticised by Sturmdorf. The present technics of the writer, to be described farther on, embrace as one of its features capsule fixation without suture of the kidney substance.

The following operators denude the kidney substance, either resecting the flap of capsule proper or folding it back, and pass their sutures through both the kidney substance and the attached or both attached and reflected layers of the capsule proper: Lloyd, who was the first to strip back the capsule proper and denude the kidney in performing nephropexy, Hahn quoted by Frank, Courvoisier quoted by Sulzer, Terillon, Rose reported by R. Wolff, Tuffier (*b*), Tricomi, Jonnesco, Craig, Thomas, A. L. Smith, R. R. Smith, and Schiassi.

One writer alone, Sottocasa, has gone just a step farther, and proposes to anchor the kidney by sewing a muscular bundle or column prepared from the quadratus lumborum into a ditch or trough made by incising the denuded kidney substance to the depth of one centimetre along its convex border. His operation thus far has been only tried on dogs.

THE QUESTION OF REGENERATION OF DESTROYED KIDNEY PARENCHYMA.

The discussion of methods involving the passage of sutures through the kidney parenchyma raises several questions of practical importance, first among which is that of the regeneration of kidney substance after injury or destruction. Researches and experiments in this direction have thus far only been conducted upon animals, chiefly dogs; and it remains an open question as to how far the deductions drawn therefrom may be applied to the human species. Le Cuziat, after nephropexies with suture of the parenchyma, found a fibrous cord half a millimetre in diameter along the entire length of each suture tract, with induration extending to a

distance of three to four millimetres, changes which Jonnesco confirms and calls innocent. Pisenti is very positive that after resection of a portion of a kidney the defect is replaced by blood-clot in which connective tissue soon forms, from which connective tissue new uriniferous tubules and glomeruli are later on reproduced. Tuffier (*b*), in several similar experiments, has but once witnessed anything suggesting a new formation of kidney elements proper.

The elaborate experiments recently recorded by Max Wolff, however, seem to me the most convincing in this direction. Wolff finds that a new formation, a true hyperplasia, of uriniferous tubules and glomeruli never takes place. The tubules and glomeruli in the remaining parts of the kidney simply undergo a compensatory hypertrophy. The epithelial cells of pre-existing tubules also undergo hypertrophy together with a very moderate hyperplasia. For the present I deem it wise to base practical action upon these conclusions, although clinical evidence of the harmfulness of kidney sutures in man has as yet not been forthcoming.

OPERATIVE FRACTURE OF THE KIDNEY AND URINARY FISTULA.

The second and third questions arising in the consideration of sutures passed through the kidney parenchyma relate to practical technics, and are more or less interdependent. I refer to fracture of the kidney substance and urinary fistula following operation. H. Morris (*c*), Tuffier (*b*), Jonnesco, and others have warned against fracturing the very friable kidney tissue by careless handling or undue traction upon sutures passed through the kidney substance. It is quite likely that this accident has occurred once or oftener to every operator who has performed many nephropexies with parenchyma sutures. It has happened to the writer on three or four occasions to thus fracture a kidney with one of the sutures passed through its tissue; and it is surprising how little force, or rather how little want of gentleness, is required to produce the accident. In one instance in the writer's practice, the

transit of the needle itself through the kidney suddenly fractured the organ from needle tract to cortex.

It is quite possible that this accident was responsible for the only three cases of urinary fistula following nephropexy, that of Boldt, Villeneuve, and Montgomery (*b*), which I have been able to find reported. To these the writer would add a personal unpublished case, in which a urinary fistula appeared three weeks after nephropexy and persisted for three and a half months, at the end of which time it closed spontaneously.

It is for reasons apparent from the above consideration of the subjects of repair of the kidney after injury, fracture of the kidney by sutures, and urinary fistula following nephropexy, that the writer abandoned parenchyma sutures as soon as he saw his way clear to a reliable capsule proper fixation method with denudation, but without suture, of the kidney parenchyma.

PREPARATION OF THE PARTS TO WHICH THE KIDNEY IS ANCHORED.

So much for the preparation of the kidney itself and of its proper and fatty capsules for fixation. Let us now turn our attention to a consideration of the parts to which it is to be attached. On this subject we find greater unanimity among operators, practically all agreeing that the firm and stationary structures of the loin, situated as they are so near the normal habitat of the kidney, afford excellent anchorages for the loose organ.

The fibrous structures and aponeuroses lining the posterior abdominal wall, the denuded quadratus lumborum, the periosteum of the lower two ribs, and even the twelfth rib itself, have been utilized as anchorages. Jonnesco passed the outer ends of all his kidney sutures through the periosteum of the eleventh and twelfth ribs. Tuffier (*b*), Kuester, Lowson, Bazy, and Fisher quoted by Derocque, all prefer to pass the uppermost suture through the periosteum of the twelfth rib, or even through the eleventh intercostal space. The writer has tried both procedures in a few cases, but fails to see any de-

cided advantage in the practice. We believe that with proper technics, and with care and accuracy in their application, a firm anchorage can be established between the denuded kidney and the bared quadratus lumborum in every case.

In the earlier operations of nephropexy, and probably in the earlier efforts of the majority of the earlier operators, the idea dominated that the kidney ought to be anchored as high up as possible underneath the ribs. The fact was not sufficiently recognized and appreciated that it is the mobility of the kidney which gives rise to the symptoms, and that the latter will be perfectly relieved by anchorage of the loose organ even at some distance from its normal habitat.

The attempt to realize the ideal inspired the practice of anchoring more or less of the lower end of the kidney only, leaving the unattached upper pole to project upward beneath the ribs. This led in many cases to either anteversion of the upper pole or to crowding down of the kidney, in either event loosening or lengthening the new attachments created by the operation, and often resulting in the return of the old symptoms. Hahn himself, quoted by Frank, was the first to recognize and call attention to his early errors in this regard, and to insist upon a low anchorage of the kidney. It is rather astonishing, therefore, in view of the now well-established fact that attempt to anchor the lower half of the kidney only simply invites a failure, to find Senn in 1897, McArthur in 1899, F. C. Ferguson in 1900, and Goelet in 1901, advocating such practice.

The importance of maintaining the normal relations of the long axis of the kidney to the long axis of the body in performing nephropexy goes without saying, and is taken into account by every operator. Jonnesco's method of anchoring the kidney lengthwise of the eleventh and twelfth ribs is the only operation open to criticism on this score.

Sound surgical principles, and even common sense, have sometimes been violated by the ultra-mechanical in performing nephropexy. In making this statement we have in mind more especially those operations which anchor the kidney more or

less completely outside of the abdominal cavity, embedding it in the muscles of the back. Tuffier (*b*) appears to have at one time employed this method, for he states that he has abandoned and now condemns his former operation of fixation of the kidney "entre les plans musculaires, réédité par plusieurs auteurs." Rose reported by R. Wolff, after denuding the kidney of its proper capsule, sews it fast to the vertebral margin of the skin wound, so that the upper pole of the kidney comes to lie below the twelfth rib. F. D. Tait, in the discussion of a paper by Bazet, says, "In order to avoid all suturing of the kidney, I have sought to obtain strong adhesions by displacing the kidney backward through a vertical incision of the aponeurosis of the transverse. The kidney is then partially delivered. The ends of the aponeurotic incision are then closed, sufficient space being left for the pelvis and vessels." McArthur does exactly the same thing, except that he operates through an anterior abdominal incision. Neither Tait nor McArthur appear to have performed their operations on man. The method of Jaboulay, to be detailed farther on, is alluded to by Jonnesco as an "exonephropexie," although the reason for this designation is not very clear to the writer.

In all such operations the *ne nocere* principle and fair play seem to be lost sight of entirely. The unnatural anchorage and position of the kidney must certainly distort and stretch, to a greater or less extent, the renal vessels and the ureter, and expose the kidney itself to insults and traumatisms against which it is normally protected by the intervention between the organ and the external world of the osseous structures and the strong, thick muscles of the back. The researches of Menge have proven, and daily observation confirms the fact, that even ordinary palpation of the kidney for purposes of examination is generally followed by transient albuminuria and the appearance of blood and casts in the urine. How must a kidney suffer which, from its situation within the muscles of the back, is exposed to almost endless greater or lesser traumatisms? R. Wolff, whose admirable and painstaking investigation of the final results of twenty-two nephro-

pexies performed by Rose upon twenty patients still stands as an unapproached model in the literature of nephroptosis, states that daily changes of dressings were required for from eight to ten days after operation, due to leakage of very small quantities of urine; that acute nephritis followed the operation in no less than three cases; that the kidney years after could be easily felt in the scar; and candidly admits that in one instance at least the outward displacement of the kidney was overdone, with the result that lumbar hernia containing the kidney followed the operation. It is but fair to state that the nephritis so frequently following Rose's operations may, in addition to the technics, be due partly to the double anæsthesia employed, one for examination to establish the diagnosis and one for operation.

SUTURE MATERIAL.

All the different suture materials used in general surgery—silk, silkworm-gut, silver wire, kangaroo tendon, catgut, plain and chromicized, etc.—have been employed according to the predilection of different operators, in the performance of nephropexy. In employing absorbable sutures passed through the kidney substance, it is well to remember a fact long ago pointed out by Newman (*b*), and confirmed by my own experience, that the portion of suture lying within the kidney is absorbed much more rapidly than the balance of the same suture string, the living renal tissue possessing an unusual power of absorption.

Mention must also be made of those methods which employ living tissue, derived from the body itself of the patient, as sutures to anchor the kidney. Pouillet and Vulliet first essayed this departure by forming fibrous strips from the tendon of the latissimus dorsi and using them to sew fast the kidney. Ramsay applied the method with success upon both kidneys of the same patient, and as progressive a surgeon as H. Morris (*c*) likes the method and practises it alongside of his own. Derocque has published a procedure of sewing fast the kidney with the periosteum of the twelfth rib after excising the latter, but abandoned the procedure on account of

the danger of wounding the pleura. Witzel places a silver-wire net in the superficial fascia, and to it anchors the kidney and its capsules with silver-wire sutures.

NEPHROPEXY WITHOUT SUTURE.

There remain for mention and consideration the methods of nephropexy in which the kidney is anchored without sutures of any kind. Such were the cases of Wendel, already described in detail, and of Walker, elsewhere mentioned, in which a movable right kidney and a distended gall-bladder coexisted. The gall-bladder alone was operated upon in Walker's case, and on examination some time afterwards the kidney was found anchored. H. Morris (*c*) mentions a case of movable kidney in which fixation of the organ followed a simple exploration through a lumbar incision. The writer has had a similar experience in the case of a physician upon whom he operated for appendicitis, and who at the time of operation had an extremely movable right kidney. An anterior abdominal incision through the rectus muscle had to be prolonged upward from the usual site to the very margin of the ribs to follow to its termination beneath the liver and right kidney an extremely long appendix running upward behind the ascending colon. In enucleating the tip of the appendix from beneath the right kidney, the perirenal fat was freely exposed and manipulated. After recovery the right kidney was found securely anchored, and remained so anchored when the patient was last seen, nearly a year after operation. Cheyne reports a remarkable and unique case of operation upon a movable third kidney, proven to be such by an anterior abdominal section. No attempt was made to anchor the kidney; it was simply placed behind the peritoneum and the peritoneum closed over it. The abdomen was closed and the symptoms disappeared.

Myles details his method of nephropexy without sutures or tamponade. The perirenal fat is all removed; the capsule proper is split along its whole length; the glistening tendons of the quadratus and psoas muscles are laid bare; and the raw kidney is allowed to rest against this fibrous surface. He

reports that his kidneys remain securely anchored even after five years.

Riedel, in 1892, was, I believe the first to propose and practise extensive tamponade around the kidney for the purpose of exciting adhesive inflammation, and thus anchoring the kidney. The details of his rather severe and heroic operation and after-treatment cannot be briefly stated, but must be studied in the original. His method, however, although depending upon tamponade for permanent fixation, cannot with strict fairness be classed as one without sutures, as catgut sutures are used to attach the capsule proper to the raw quadratus lumborum, and the skin incision is partially closed over the tamponade by sutures. He has thus anchored six kidneys in five patients. Obalinski operated on a case by Riedel's method, with relapse in a year, and Roesing reports an operation by the same method in which the failure was immediate.

The method of Jaboulay, published in 1895, also depends upon healing by granulation within the fatty capsule, which is opened and pulled out as far as it will come. The excess is cut away, and the margins of the resected fatty capsule are then sewn to the skin margins of the wound in such a way as to leave a pouch of fatty capsule with the kidney at its bottom. This pouch is tamponaded with gauze until filled by granulations. Senn carries out the same principle in his method proposed in 1897, except that he resects the fatty capsule, tamponades around the unopened capsule proper, and dispenses with the use of sutures of any kind. Senn, as already stated, tamponades around the lower pole of the kidney only, leaving the upper pole free.

Deaver improved upon Senn's method by tamponading around both the upper and lower poles, a practice in which he was followed by Downes and Biondi. None of the operators mentioned opened the capsule proper, which was simply scarified to provoke adhesions. Witzel, in his earlier cases, followed this method, adding incision of the capsule proper and denudation of the kidney. Fisher, cited by Derocque, in place of the gauze, employs two decalcified bone drains, one

passed beneath the upper and one beneath the lower pole of the kidney, while Beyea loops a rubber drain beneath each pole of the kidney to sustain the organ in place.

The idea underlying all tamponade operations, that adhesions obtained by granulation are stronger and less liable to stretching than those obtained by primary union between properly prepared surfaces, has so often been proven fallacious that it is scarcely worth while to even mention it. Apart from their inferiority on this score, tamponade nephropexies are more unsurgical than those striving for primary union, just as the surgeon, in the performance of any operation whatsoever, when compelled to use the tampon, must always feel regret that more ideal surgical means will not answer or cannot be applied. In addition to this, the unnecessary annoyance and pain of the after-treatment should, from the patient's point of view, also be taken into consideration.

DRAINAGE.

In tamponade operations without suture, the gauze or other material used acts at the same time as a drain. Of recent writers, Selmi appears to be the only one still advocating a combined suture and gauze tamponade method; quite different, however, from the elaborate operation of Riedel.

Drainage of some sort constituted a feature of the technics of most of the earlier operations performed upon the kidney, nephropexy included. One or another operator gradually, in a tentative way, closed for primary union in some of his nephropexies, until finally the majority of operators at the present day make complete closure of the wound the rule, draining, if at all, only in exceptional cases and under special indications. Among recent writers upon the subject, however, we still find A. B. Johnson, Goelet, and Beyea advocating drainage of the wound. The drains used do not differ from those employed elsewhere.

BILATERAL NEPHROPEXY.

Bilateral operations are recorded but rarely in the first ten years of the history of the operation, and still more rarely

were both kidneys anchored at one sitting. Some operators seem to view with feelings akin to horror simultaneous operation upon both kidneys, and Vance even cites it as an instance of "surgical fanaticism."

The comparative frequency with which different operators perform bilateral nephropexy varies greatly even in recent times, as a glance at the following list will indicate.

Operator.	Date of Report.	Number of Patients.	Bilateral Nephropexies.
Tillmanns.	1892	16	One at one sitting.
Rose (R. Wolff).	1897	20	Two at two sittings each.
Tricomi.	1897	23	None.
Johnson, A. B.	1899	15	One at two sittings.
Lobstein.	1900	23	None.
Kuester (Geiss).	1900	99	Nine bilateral.
H. Morris.	1901	98	"In several instances," in each at two sittings.
Johnston, G. B. (personal communication).	Oct. 8, 1901	106	Two bilateral; one at one, and one at two sittings.
Noble, C. P. (personal communication).	Oct. 11, 1901	56	Fifteen bilateral; fourteen at one sitting, and one at two sittings.
Baldwin, J. F. (personal communication).	Oct. 6, 1901	34	Three bilateral at one sitting.
Edebohls.	Oct. 15, 1901	186	Seventy-four bilateral; sixty-eight at one sitting, and six at two sittings.

The writer has performed in all 261 nephropexies upon 186 patients.

In 108 cases the right kidney alone was anchored, 108 nephropexies.

In 3 cases the left kidney alone was anchored, 3 nephropexies.

In 1 case the right kidney was anchored twice, 2 nephropexies.

In 68 cases both kidneys were anchored at one sitting, 136 nephropexies.

In 6 cases both kidneys were anchored at two sittings, 12 nephropexies.

Total, 186 patients, 193 operations, 261 nephropexies.

In two of the three cases in which the left kidney alone was anchored, the right kidney was removed at the same sit-

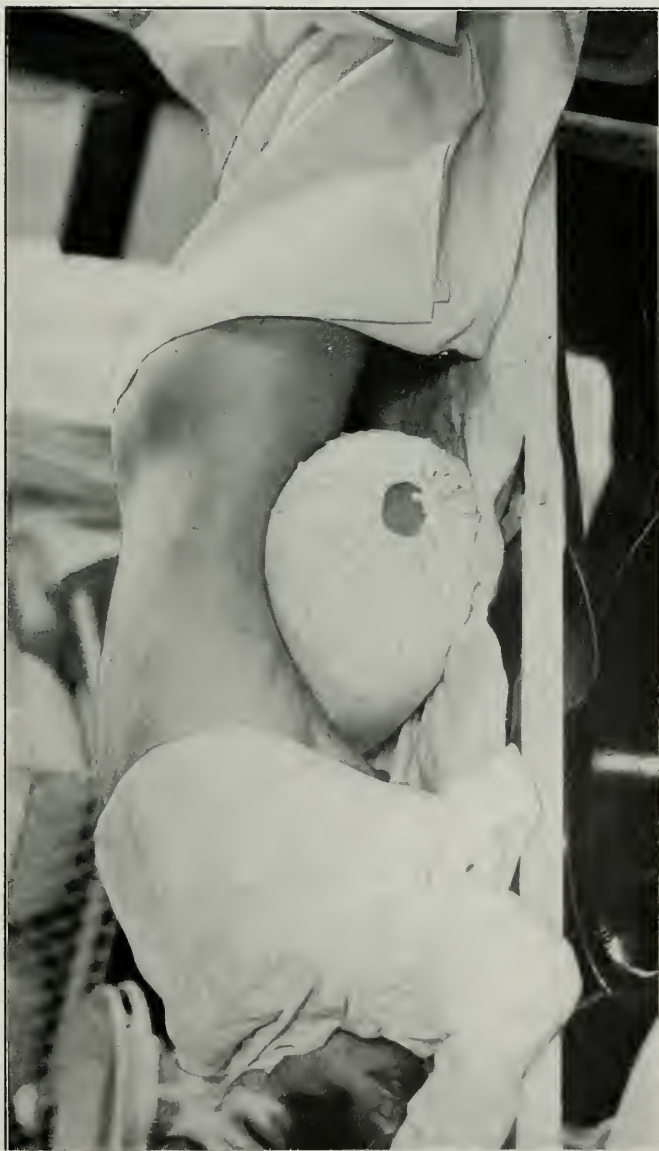


FIG. 3.—Edebohl's kidney air-cushion, with patient in position for operation.

ting with the left nephropexy, right nephrectomy being called for in one patient by a huge pus kidney, and in the other by renal tuberculosis. Both patients recovered. The increasing frequency of bilateral nephropexy in the practice of the writer is shown by the fact that on his first fifty patients he performed bilateral nephropexy ten times; on the second fifty, fifteen times; on the third fifty, twenty-eight times; and on the last thirty-six, twenty-one times.

Bilateral nephropexy is especially indicated in patients in whom mobility of both kidneys is complicated with nephritis. Of seventeen such cases upon which the writer has performed nephropexy, the nephritis was confined to the left kidney in four, and to the right in four, while in nine it was bilateral. Bilateral nephropexy was performed upon thirteen of this group of seventeen patients.

AIDS IN PERFORMING NEPHROPEXY.

The kidney air-cushion, devised and presented to the profession by Edebohls (*b*) in 1893, has continued to prove a valued aid in the performance of nephropexy, enabling us to dispense with Sims's posture and with pillows or the hands of an assistant placed beneath the patient's abdomen. The kidney air-cushion is a hollow cylinder of rubber, twelve to fourteen inches long and eight inches in diameter, inflated and deflated by a valve placed in one head of the cylinder. The patient is placed prone upon the table, lying with the abdomen upon the air-cushion placed beneath her with its long diameter at right angles to the long axis of the body. A flat or slightly convex operative field, instead of a concave one, is thus presented, with the twelfth ribs and crests of the ilium separated to the utmost extent, and the kidneys are lifted well into the wound on top of the intestines. Either kidney can be exposed with equal facility, or both can be operated upon without any change of position. The maintenance of anæsthesia is easy and respiration is unimpeded in the position described, the elevation of the abdomen upon the cushion freeing the chest from pressure by the table. If the air-cushion has been cor-

rectly placed, the kidney will show at once at the bottom of the wound on completion of the incision through the parietes. Should the kidney recede upward beneath the ribs, traction upon the legs will roll the patient on the cushion until the latter comes to lie beneath the lower ribs, and by compressing them displaces the kidney downward into the wound.

The kidney air-cushion also renders easy of attainment another valuable aid in performing nephropexy. I refer to delivery of the kidney through the wound onto the back for exploration, for preparation of the organ for fixation, and for the passage of sutures. Cornil, in 1889, details a nephropexy during which he drew the kidney into the wound for exploration, but passed it back again before introducing the sutures. Briggs, while performing lumbar nephrolithotomy, in 1891, took the kidney out for exploration and made it straddle the wound. He thought the procedure original with himself, until he found a note by H. Morris (*a*) in which that surgeon states that he practised it in a case operated upon by him in 1892.

Early in my work I noticed that with the patient on the air-cushion as above described, the kidney now and then delivered itself out of the wound without any aid on the part of the operator, and ever since that time I have practised delivery of the kidney as a routine procedure in the performance of nephropexy (Fig. 4). As illustrating the advantages of the procedure, I take the liberty of quoting from the *Transactions of the New York Obstetrical Society*, April 18, 1893:

"The use of this cushion has also enabled Dr. Edebohls to improve upon the technique of the operation itself. Instead of passing the sutures through the kidney in the depths of the wound, he now took the kidney to be operated upon out through the lumbar incision, and thus having free access to the entire organ he was able to inspect and palpate it thoroughly and to do much more accurate work, splitting and reflecting the capsula propria to the exact extent required, and in the exact situation desired. He then passed his sutures through the kidney, after which the organ was replaced in the body and the ends of the kidney sutures passed on each side through the muscles and fascia."



FIG. 4.—Kidneys delivered onto the back. One kidney is delivered at a time, as the almost universal rule. Simultaneous delivery of both kidneys may very rarely be required for comparative examination, as in the case illustrated.

Of recent writers, Myles and Schiassi speak of employing methodical delivery of the kidney in performing nephropexy.

Thorough exploration and accurate work are easy upon the delivered kidney, difficult upon a kidney constantly moving up and down at the bottom of a deep lumbar wound. The difficulties are familiar to the practical surgeon, and but one of them is alluded to by Terillon, when he states, "There are cases in which the kidney capsule cannot be seized, and we must be content to suture the fatty capsule."

Without delivery of the kidney, it may be, and often is, difficult, if not impossible, to know exactly what part of the kidney surface you are attaching.

This was illustrated in one of my patients upon whom nephropexy had been performed a year previously by a distinguished surgeon. Intolerable pain and malposition of the kidney rendered necessary a second operation, at which the very apex of the upper pole of the kidney was found anchored by a strong band, two centimetres thick, extending between the unopened capsule proper and the lumbar muscles. The free body and lower pole of the organ projected directly forward towards the anterior abdominal wall. Delivery of the kidney at the first operation would have guarded against the mistake and spared the patient a second operation. Redetachment and proper anchorage of the kidney were followed by complete relief of symptoms.

ACCIDENTS DURING OPERATION.

Fracture of the kidney by needle or suture has already been spoken of.

Accidental opening of the peritoneum, broadly speaking, is not in itself a serious matter, and has happened a number of times to many operators. Still, in the very first case in which the writer opened the peritoneum, the latter was accidentally infected, probably from a beginning diphtheritic affection of the operator's throat, not recognized until immediately after the operation, and the patient unfortunately died of septic peritonitis. During the past three years and over I have designedly opened the peritoneum for the purpose of

removing a more or less diseased vermiform appendix in the majority of the patients upon whom I have performed right or bilateral nephropexy.

Accidental opening of the pleura is a rather more serious, but fortunately, also, a rarer, accident of nephropexy. Ceccherelli was, to my knowledge, the first to report a case of this accident during nephropexy. His patient died, his death being ascribed by Ceccherelli to collapse due to widespread vascular changes, and not to any direct result of the accident. Since then one or another operator, especially among those who anchor the kidney to the periosteum of the twelfth rib, resect the rib, or pass a suture through the eleventh intercostal space, mentions the occurrence of the accident. I myself accidentally opened a low pleura in one of my operations, and air was aspirated into the pleura in large quantities before the opening could be closed by suture. The resultant pneumothorax disappeared in four days without leaving any traces, or indeed without having given the patient any perceptible inconvenience.

Accidental division of the ureter I find recorded in one instance only, an operation by H. Morris (*c*), who endeavored to repair the injury by uretero-ureteral grafting by Van Hook's method, but was subsequently obliged to remove the kidney.

ANÆSTHESIA.

Ether alone, or preceded by nitrous oxide, was the anæsthetic used in all of my nephropexies, four excepted. In two of these the kidney was anchored under local anæsthesia by the infiltration method of Schleich, one of them, however, receiving a little ether towards the close of the operation. The third patient, a woman with acute inflammation of both displaced kidneys, was anæsthetized with nitrous oxide and oxygen for the performance of bilateral nephropexy. Upon a fourth patient, a woman of rare self-control, I performed under spinal cocainization, at one sitting and painlessly, right nephropexy, lumbar appendicectomy, curettage of the uterus, and inguinal shortening of the round ligaments.

My experience, therefore, does not lead me to share the fear of some respecting the use of ether in performing nephropexy, and I see no reason why any surgeon should not employ in his operations upon the kidney the particular anæsthetic which he prefers in his surgical work generally.

CONFINEMENT AFTER OPERATION.

The length of time for which operators keep their patients in bed after the performance of nephropexy seems to vary greatly. R. T. Morris (*a*), in a clinical lecture, mentions a case which had just left the hospital twelve days after operation. Witzel, with his new wire-net and silver-wire technics, allows his patients to be up in ten or twelve days, instead of after four to five weeks, as formerly. Tuffier (*b*) considers three weeks in bed as sufficient; Rose, Senn, and Deaver require four to five weeks; Hildebrand four to six weeks; Fisher, cited by Derocque, sixty to eighty days; and Riedel ten to twelve weeks. The writer has uniformly kept his patients on their backs for three weeks after operation; and his experience has amply demonstrated that this length of time is sufficient for the new anchorage of the kidney to become solid enough to sustain the kidney in position after the patient assumes the erect posture. Possibly a somewhat shorter confinement would answer the purpose; I have not as yet, however, found the patient who, after the situation was clearly explained to him or her, was willing to make a personal test of the matter by getting up before the end of the three weeks which I advised spending in bed.

NEPHROPEXY AND NEPHRITIS.

Nephropexy is an operation which one would naturally expect to be followed by nephritis in a larger proportion of cases than obtains when operating on other parts of the body. Such, however, does not appear to be the case. If we except the unique experience of Rose, reported by R. Wolff, who observed acute nephritis following three of his twenty-two nephropexies,—an experience which we have already made

an attempt to explain,—we find nephritis reported no more frequently after nephropexy than after any other operation requiring general anæsthesia. Of the 186 patients upon whom I have performed either single or double nephropexy, only two had a well-marked acute nephritis as a result of the operation. The affection ran a course of six weeks in one case and of two months in the other, and then permanently disappeared. Was ether or manipulation of the kidney, or were both, responsible for the nephritis? The husband of one of the patients, a physician, regarded it as an ether nephritis in his wife's case.

A certain degree of kidney irritation, as manifested by transient slight albuminuria and a few blood-cells in the urine, both phenomena lasting from a few hours to a day or two, followed in about one out of ten of my nephropexies. Both the frequency and the degree, however, of these manifestations of kidney irritation were no greater than those which the researches of Menge have shown to follow simple palpation of the kidney for diagnostic purposes. Possibly the undesirable effects connected with handling the kidney were counterbalanced in my nephropexies by the local abstraction of blood from the organ which goes with stripping off the capsule proper. This is rendered probable by comparison with the experience of Jaboulay, for instance, who after the very first nephropexy performed by his tamponade method, without opening the capsule proper and without suture of the kidney, found 70 per cent. of albumen in the urine,—the result, he considers, of merely handling the kidney. On the other hand, no less than sixteen of my own cases of nephropexy came to operation with chronic nephritis, and one with acute nephritis. Not only was the inflammation of the kidneys not aggravated in any case, but the great majority of the patients were permanently cured of their nephritis as one result of the operation. Six of the patients suffering with chronic nephritis at the time nephropexy was performed upon them are in perfect health, and the urine remains free from albumen and casts at periods varying from two to over eight years after

operation. The great majority of the others have been operated upon within the past two years, and, although they are progressing favorably, it is in their cases as yet too early to speak of final results.

HERNIA FOLLOWING NEPHROPEXY.

I find on record nine cases of lumbar hernia following the operation of nephropexy. In five cases there was hernia of the kidney itself; in one the colon and intestines formed the contents of the hernial sac; and in three the protruding viscus or viscera are not mentioned. In the cases reported by Wilcox (*a*), Guyon cited by Mayolle, Rose cited by R. Wolff, and Witzel, no mention is made of any attempt to close the hernia. Both cases of Hahn, cited by Frank, and that of Albarran (*a*) were successfully operated upon, whereas McCosh operated twice upon the same hernia with recurrence soon after each operation.

It is probable that the technics employed in performing nephropexy had something to do with the production of the hernia in the majority, if not in all, of the above cases. It is difficult to understand how a hernia can follow the lumbar incision carried from rib to ilium along the outer border of the erector spinæ, unless the incision be extended forward at either end, or unless the kidney be embedded in the muscles as part of the technique.

PRINCIPLES UNDERLYING NEPHROPEXY.

The kidney is maintained in its normal position mainly by the configuration of the paravertebral niches (Wolkow and Delitzin), aided by the lamina fibrosa of the fatty capsule. It is of paramount importance to bear in mind that these natural aids to sustentation of the kidney are not available in performing nephropexy, and that we are dependent upon abnormal or artificial anchorages for the success of the operation. In other words, we cannot replace and sew fast the kidney in its paravertebral niche, and we cannot restore the lost tone of the lamina fibrosa. Indeed, we sacrifice whatever may be

left of the latter when we cut away the fatty capsule. Firm healing of the kidney to a new place of anchorage by primary or secondary union is what we strive to obtain. The broader, therefore, the surfaces for union, and the better adapted for

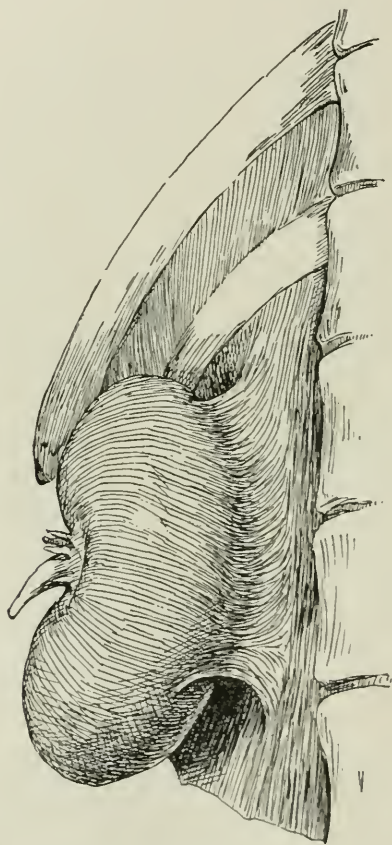


FIG. 5.—After Mayolle, from a patient of Duret, who died of pulmonary tuberculosis six months after right nephropexy. Kidney turned outward to show connective-tissue band, six centimetres long by two centimetres thick, resulting from operation and attaching kidney to posterior abdominal wall.

firm healing to each other, the stronger will be the anchorage. The writer believes that broad denudation of the kidney by stripping off a large area of capsule proper on the one hand,

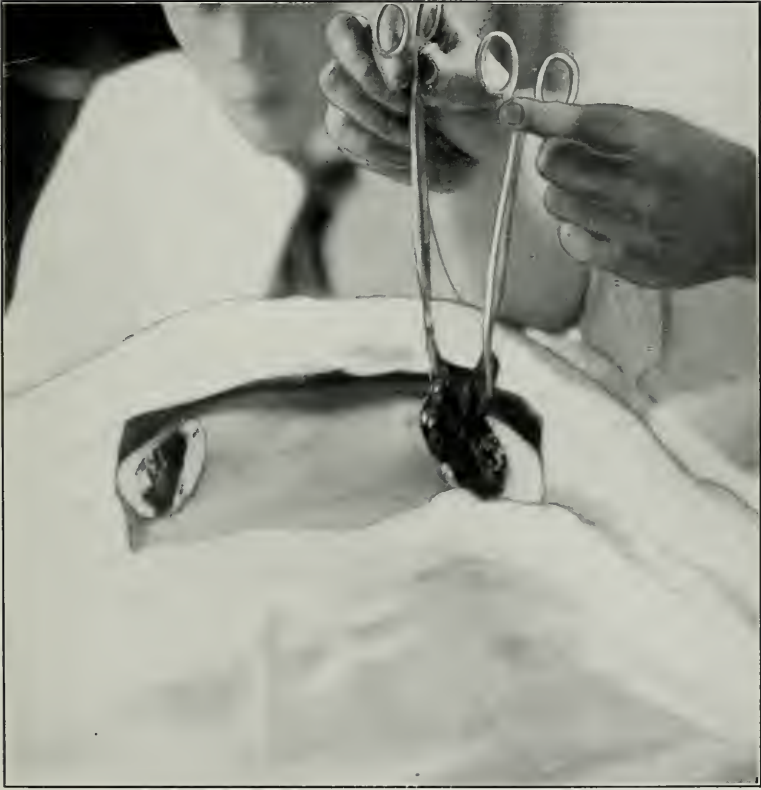


FIG. 6.—Fatty capsule lifted by forceps for complete excision, which is readily accomplished with the kidney delivered.

and laying bare the quadratus lumborum along its whole length on the other, will give us the best tissues and largest surfaces available for firm and broad union.

The relations of the kidney to its surroundings after anchorage are also an important matter in reference to the final result. We have already alluded to the mistakes of anchoring the kidney too high and of attaching its lower half only. The weight and variations in size of the liver will put to a severer test than it is fair to impose, the solidity of all such anchorages of the right kidney at least, and nothing is gained, as far as therapeutic results go, over a somewhat lower anchorage. My own practice in selecting a new home for the kidney is to anchor it squarely in the loin anterior to the quadratus lumborum muscle, and so situated that the middle part of the kidney fills the lumbar space, the upper pole projecting as far upward beneath the rib as the lower pole reaches downward below the level of the crest of the ilium (Fig. 2).

If absorbable sutures are passed through the kidney in performing nephropexy, they should be chromicized to last at least six weeks, bearing in mind the specially rapid absorption of sutures on the part of the renal parenchyma.

Finally, the fact that primary healing is stronger and firmer than healing by granulation should be given due weight in practice.

CHANGES IN AUTHOR'S TECHNICS.

The writer has from the very first, and in all his nephropexies, practised the lumbar incision, denudation of the kidney substance, and rawing of the quadratus lumborum muscle. Experience, also, taught him very early not to endeavor to anchor the kidney too high.

In my first cases the kidneys were anchored by silkworm sutures passed through the entire thickness of the abdominal wall on either side of the incision, through the edges of the resected fatty capsule, through the reflected and the still attached layers of the capsule proper, and through the parenchyma of the kidney. With my fifth case I began to bury the kidney sutures, using successively silkworm gut, kangaroo

tendon, and, finally, from the fortieth case to the present, catgut chromicized to last about forty days. Drainage, at first by rubber tubes, and later by strands of silkworm gut, was employed in perhaps my first fifty cases and then definitely abandoned. With the routine practice of delivery of the kidney through the wound for the purpose of preparing the organ for fixation, I came to resect the fatty capsule more and more liberally, until now I remove it entirely. Sutures through any part of the kidney substance were abandoned by me about a year ago for reasons already stated.

Suture of the opened and stripped back capsule proper to the fascia lining the depths of the wound was tried in a few cases. The bulging of the raw kidney into the wound while suturing renders this procedure difficult, if not impracticable.

AUTHOR'S PRESENT METHOD OF NEPHROPEXY.

After the above critical and general considerations relating to every feature of the technics of nephropexy, the author's present method of anchoring a movable kidney by capsule proper fixation may be described as follows:

Place the patient prone upon the table with the author's kidney air-cushion underlying and supporting the abdomen (Fig. 3).

Make a straight incision along the outer border of the erector spinæ from lower border of last rib to crest of ilium. Should the space between the rib and ilium be unusually narrow, carry the incision a little more obliquely, so that its lower end will reach the ilium slightly to the outer side of the attachment of the erector spinæ.

Bluntly separate the fibres of the latissimus dorsi from each other just over the outer border of the erector spinæ, without opening the sheath of the latter (Fig. 9). Split the transversalis fascia and expose the perirenal fat. Draw the iliohypogastric nerve to one side or other out of the way of injury. If this cannot be done and the nerve must be divided,

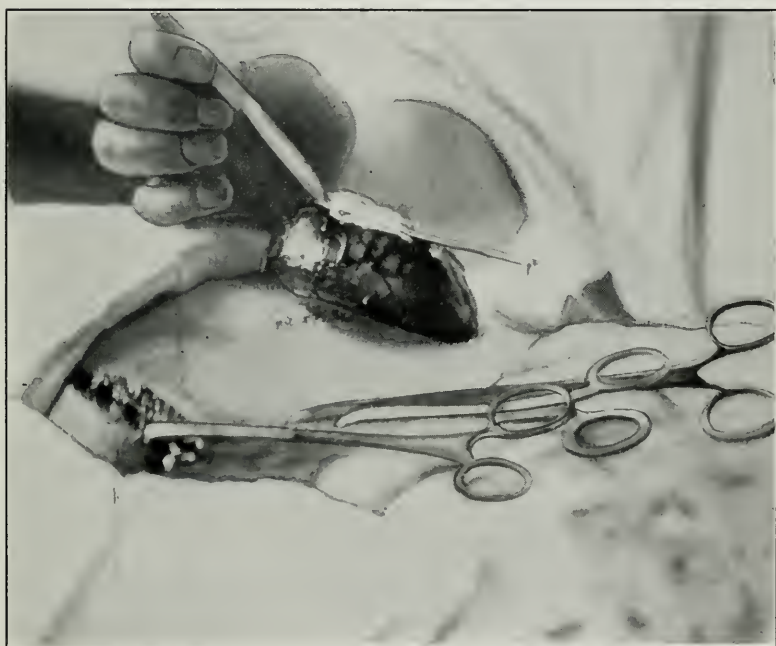


FIG. 7.—Splitting of capsule proper of kidney on a grooved director, to avoid wounding of kidney tissue.

reunite the severed ends with catgut after^e anchoring the kidney and before closing the wound.

Open the sheath of the quadratus lumborum from rib to ilium along the anterior aspect of its lateral border. The retraction of the cut edges of the sheath will expose a large area of raw muscle.

Free the kidney as far as necessary by blunt dissection with the fingers, aided by an occasional clip of the scissors.

Deliver the kidney with its fatty capsule through the wound onto the back (Fig. 4). Traction upon the fatty capsule, aided by rolling the patient upward or downward, as may be necessary, on the air-cushion, facilitates this part of the procedure. The upper pole of the kidney generally, though not always, emerges first, the rest of the organ following. Should the opening through the walls of the abdomen prove too small for delivery of the kidney, enlarge it by nicking the outer fibres of the quadratus near its iliac insertion.

Dissect off and remove the whole of the fatty capsule, exposing the capsule proper throughout its entire extent (Fig. 6). Explore by palpation the kidney, its pelvis, and the upper end of the ureter. Should anything be found to indicate puncture or incision, this is the proper time to perform either.

If removal of the vermiform appendix be indicated, open the peritoneum to the outer side of the kidney, replace the kidney temporarily in the abdomen, draw out the ascending colon, follow one of its longitudinal bands down to the root of the appendix, deliver the latter into the wound, and either invert or amputate it (Fig. 1).

After replacing the intestines explore by palpation the duodenum, common bile duct, cystic duct, gall-bladder, under surface of the liver, and pylorus, all of which are easily reached through the lumbar incision. Close the peritoneal wound by suture and again deliver the kidney to prepare it for anchorage.

Nick the capsule proper of the kidney near the middle of

the convex border just sufficiently to admit the tip of a grooved director. Pass the director through the opening and on beneath the capsule proper, between the latter and the kidney, and upon it divide the capsule proper along the entire length of the convex border of the kidney to half-way around both the upper and lower poles of the organ. Separate the capsule proper by blunt dissection on either side of the incision from the kidney substance, and reflect it forward and backward towards the renal pelvis to about midway between the external and internal borders of the kidney. This will leave denuded one-half of the kidney, more or less, the detached portion of the capsule proper being continuous with the still attached portion and turned back upon it like the lapel of a coat. Resect a portion of the detached capsule proper, if too redundant.

Pass four suspension or fixation sutures of forty-day cat-gut through both the reflected and the still attached capsule proper, close to their line of junction. Two sutures are placed on the anterior face of the kidney, one at the middle of the upper and one at the middle of the lower half of the organ. The two other sutures are placed at corresponding points of the posterior surface of the kidney. Each suture runs parallel to the long axis of the kidney, and is passed through the reflected capsule close to the line of reflection, then through the underlying attached capsule, and along beneath the latter between the capsule and the kidney substance, for a distance of two to three centimetres, when it again emerges through the attached and reflected layers of the capsule (Fig. 8). Use a Hagedorn needle, with the broad surface running flatwise between the capsule proper and the kidney substance, to avoid penetration of the latter.

Pass the kidney with the eight free suture ends hanging from the capsule proper back into the body. Pass each suture end in succession through the abdominal parietes from within outward, four to the inner and four to the outer side of the incision, each suture piercing the tissues at a distance from its fellow of the opposite surface equal to the anteroposterior

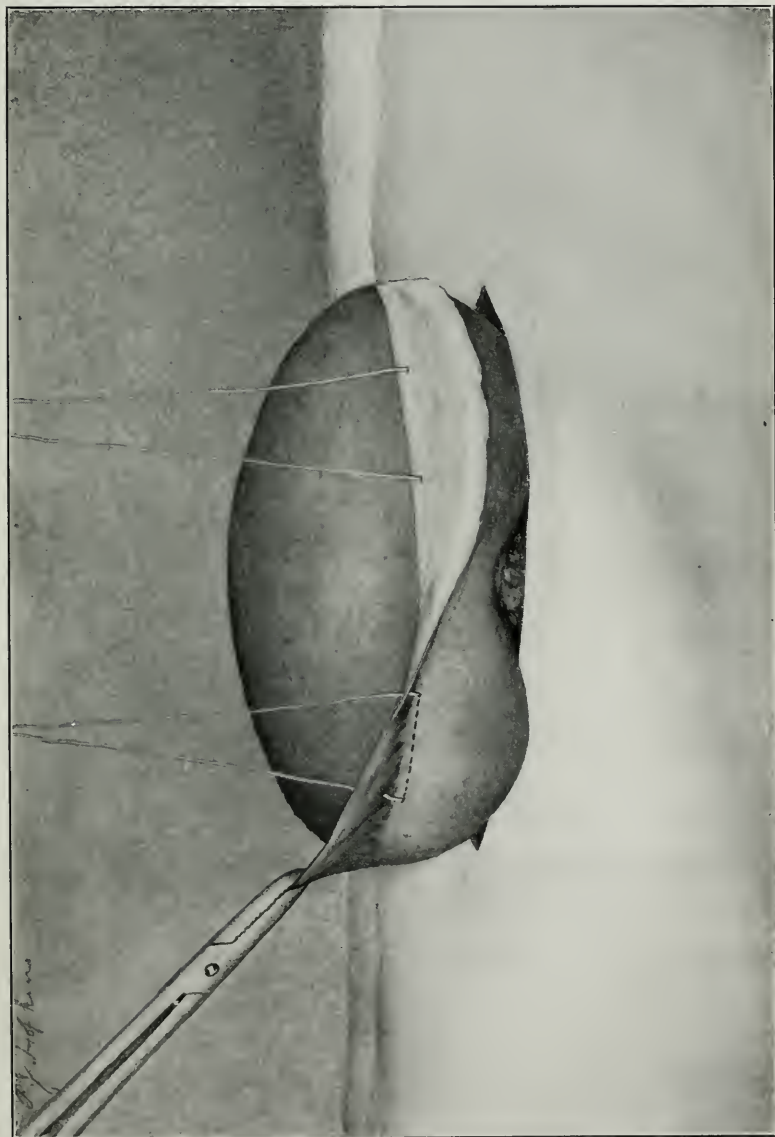


FIG. 8.—Showing two of the four suspension sutures passed through reflected and attached layers of capsule proper, without penetration of kidney substance. The two companion sutures, passed on the opposite face of the kidney, are not shown.

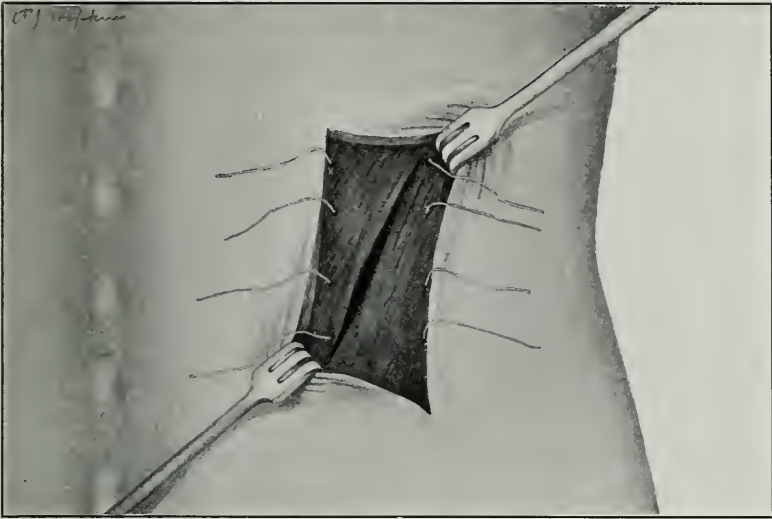


FIG. 9.—The kidney has been replaced and the ends of the suspension sutures have been brought through the abdominal wall, emerging on the outer surface of the latissimus dorsi. The fibres of the muscle have been separated from each other, not cut, in making the incision.

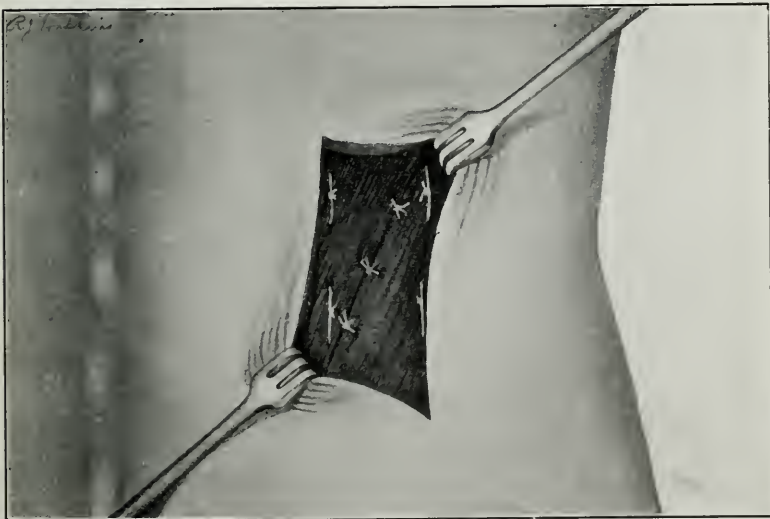


FIG. 10.—Suspension sutures and sutures closing deep parts of wound tied.

thickness of the kidney. The sutures to the inner side of the incision will pierce the retracted sheath of the quadratus near its edge, the quadratus itself, and the erector spinæ; the outer sutures will traverse the transversalis fascia and the latissimus

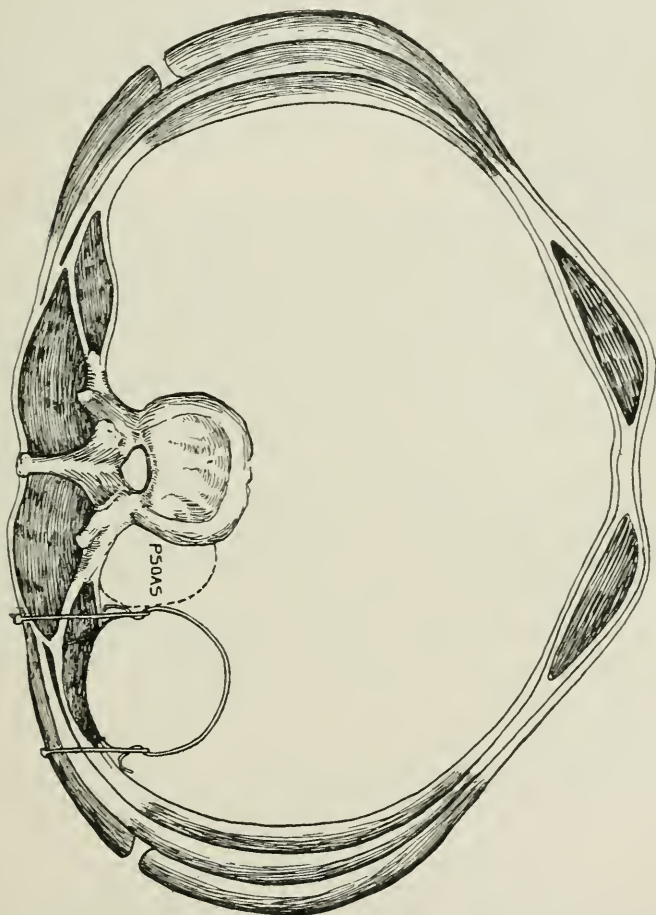


FIG. 11.—Effects of the completed operation, showing broad apposition of the denuded kidney and rawed quadratus. The track of the suspension sutures is also shown.

dorsi (Fig. 11). All of the sutures will emerge upon the surface of the latissimus dorsi at distances from each other equal to those at which they leave the capsule proper, the

highest suture ends emerging immediately beneath the twelfth rib (Fig. 9). Leave the sutures untied for the present.

Close the wound of the muscles and fascia by from four to six interrupted sutures of forty-day catgut, passed in such a manner as to turn the raw surface of the quadratus towards the kidney. This is effected by suturing the latissimus dorsi and the lumbar fascia forming the outer lips of the wound to the latissimus dorsi, the sheath of the erector spinæ and the outer lip of the open sheath of the quadratus at the inner margin of the incision.

Gently draw taut the eight ends of the fixation sutures to take in slack between the internal surface of the abdominal parietes and the capsule proper, so as to bring the denuded surface of the kidney into contact with the raw surface of the quadratus. Tie the two ends of each of the four suspension sutures to each other (Fig. 10). Bury the suspension and muscle sutures by closing the skin over them with the intracuticular suture.

The completed operation will leave the denuded convex surface of the outer half of the kidney in snug contact with the raw quadratus lumborum throughout the entire length of the latter from rib to ilium (Fig. 11), the upper pole of the kidney projecting slightly upward beneath the ribs and the lower pole reaching to an equal extent below the level of the iliac crest.

Apply the dressings across the entire width of the back, smoothly and evenly, remembering that the patient is to lie upon them for a week before changing.

MORTALITY OF NEPHROPEXY.

In compiling the following statistics of nephropexy, I have included only those operators who report fifteen or more personal cases. In reckoning the number of operations of each surgeon, I have counted a bilateral nephropexy at one sitting as one operation, while a bilateral nephropexy performed at two sittings, or a nephropexy repeated on the same kidney, is booked as two operations.

MORTALITY TABLE.

Operator.	Date of Report.	Number of Operations.	Number of Patients.	Unilateral.	Bilateral.	Deaths.	Causes of Death.
Hahn (Frank).	1889	20	16	20	0	1	Ileus existing before operation.
Tillmanns.	1892	16	16	15	1	0	.....
Albarran (<i>a</i>).	1896	23	?	?	?	0	.....
Tricomi.	1897	23	23	23	0	0	.....
Rose (Wolff).	1897	22	20	22	0	1	Uncontrollable vomiting due to dilatation of stomach and duodenum.
Tuffier (<i>b</i>).	1899	75	75	?	?	2	1. Tetanus on seventh day. 2. Bronchopneumonia.
Israel.	1899	15	15	?	?	0	.....
Johnson, A. B.	1899	16	15	16	0	0	.....
Championnière.	1899	26	26	?	?	0	.....
Lobstein.	1900	23	23	23	0	2	1. Gall-stones, two months after operation. 2. Carcinoma of stomach.
Kuester (Geiss).	1900	99	99	90	9	2	Pulmonary embolism in both.
H. Morris (<i>c</i>).	1901	98	?	98	0	1	Cardiac thrombosis.
Johnston, G. B. (personal communication).	Oct. 6, 1901	107	106	106	1	0	.....
Noble, C. P. (personal communication).	Oct. 11, 1901	56	56	41	15	2	1. Pulmonary embolism on sixth day. 2. Hæmorrhage from ulcer of stomach, one week after operation.
Baldwin, J. F. (personal communication).	Oct. 9, 1901	34	34	31	3	0	.....
Edebohls.	Oct. 15, 1901.	193	186	125	68	3	Case 4. Septic peritonitis on second day. Case 139. Pulmonary embolism on fifth day. Case 173. Intestinal paralysis on eighth day.
Total.....	.....	846	?	?	?	14	

The table gives a total of 846 operations with fourteen deaths; a mortality of 1.65 per cent. In looking over the causes of death, it must be granted that a number of them, for example, Lobstein's two deaths, Hahn's death, and one of Noble's deaths, can scarcely with fairness be charged to the operation. Deducting those four deaths reduces the mortality to 1.18 per cent. *Per contra*, the mortality rate would

probably be increased by the addition of the statistics of those operators who have performed nephropexy a few times only. Taken all in all, nephropexy may, therefore, be stated to have a mortality of somewhere between one and a half and two per cent. That one may have a long run of nephropexies without fatality is demonstrated by Johnston's 107 cases without a death, and by a running series of 135 successful operations in my own practice.

The writer's personal mortality, 193 operations with three deaths, is 1.55 per cent. In judging this mortality, it should be taken into account that more than one-third of my nephropexies were bilateral, and that appendicectomy was performed at the same sitting with nephropexy no less than fifty-two times, an anterior abdominal section four times, and nephrectomy of the opposite side twice, not to mention a number of minor operations.

I append a list of all additional operations performed by me upon my 186 nephropexy patients, 183 of whom were women and only three men. The table indicates very forcibly the frequent coexistence, in women, of movable kidney with other pathological conditions, especially in the genital sphere. It may be added that there was no fatality from any of the other operations performed on any of these 186 patients, the three deaths from nephropexy, already cited, constituting the entire mortality. Additional operations performed upon some of these same patients by other surgeons are not included in the table.

ADDITIONAL OPERATIONS PERFORMED UPON AUTHOR'S 186 CASES OF NEPHROPEXY.

	At same sitting with nephro- pexy.	At other sit- ting or sit- tings.
Excision of hæmorrhoids.....	I	
Excision of rectal fistula.....		I
Excision of urethral caruncles.....	I	I
Torsion of urethra.....		I
Suprapubic cystotomy for papilloma of bladder...		I
For closure of fistula of bladder.....		I
For radical cure of ventral hernia.....		I

	At same sitting with nephro- pexy.	At other sit- ting or sit- tings.
For radical cure of femoral hernia.....		1
* For radical cure of bilateral inguinal hernia.....		1
Perineorrhaphy	1	5
Anterior colporrhaphy		1
Vaginoplasty		3
Trachelorrhaphy	2	6
Amputation of cervix.....	14	21
Curettage of uterus.....	48	62
Dilatation and exploration of uterus.....		1
Hysteropexy	2	8
Resection of uterus for abscess.....		1
Abdominal hysteromyomectomy		3
Broad ligament myomectomy.....		1
Inguinal shortening of round ligaments.....	8	43
Intraperitoneal shortening of round ligaments....		1
Cœliotomy for liberation of adnexa from adhe- sions	1	1
Abdominal panhysterectomy for fibroma.....		3
Vaginal hysterectomy for chronic metritis.....		1
Vaginal hysterectomy for fibroma.....		4
Left salpingostomy		1
Unilateral salpingo-oophorectomy	1	4
Bilateral salpingo-oophorectomy		2
Left parovariotomy		1
Plastic operations on ovaries.....	1	7
Excision of fibroma of ovary.....		1
Unilateral oophorectomy		5
Bilateral oophorectomy		1
Unilateral ovariectomy	1	6
Bilateral ovariectomy		1
Vaginal ovariectomy		5
Vaginal incision of pelvic abscess.....		1
Inversion of appendix through anterior incision..		25
Excision of appendix through anterior incision..		7
Inversion of appendix through lumbar incision..	46	
Excision of appendix through lumbar incision....	6	
For acute gangrenous appendicitis.....		1
Right nephrectomy for tuberculosis.....	1	
Right nephrectomy for pyonephrosis.....	1	
Extrusion of choledochus stone into duodenum..		1

THE RESULTS OF NEPHROPEXY.

The results of anchoring a movable kidney to be considered are the operative or anatomic and the therapeutic.

The operative or anatomic results relate to the permanency of the new anchorage established for the kidney. We have already seen that the success of nephropexy as an operation depends upon extensive fibrous connective-tissue formation between the kidney and neighboring parts; in our method of operation, between the kidney and the raw quadratus muscle.

It is a matter of common knowledge that fibrous tissue formed as the result of wound healing varies greatly in quality and characteristics in different individuals, as is well illustrated by the differences observed in the appearance, after primary healing, of aseptic surgical incisions of the skin. The new fibrous tissue formed about the kidney as the result of nephropexy displays the same varying characteristics. In some individuals it is firm and unyielding, holding the kidney solidly against the quadratus; in others it is of looser texture, allowing of stretching to a greater or less degree, with resultant greater or less laxity of anchorage, if I may use that expression. These differences in the firmness of anchorage sometime after nephropexy are very readily recognized by educated fingers. A certain degree of mobility of the kidney after nephropexy, due to the above reasons, as well as to the fact that in some patients the extremely lax abdominal walls to which the kidneys are anchored move with the anchored organ during an examination, does not prove that the operation has been a failure. Hahn, quoted by Frank, long ago recognized and stated that absolute fixation is not necessary to therapeutic success.

For quite a while, in my earlier experience, when examining patients upon whom nephropexy had been performed either by myself or by another surgeon, I found it extremely difficult, in some cases, to decide whether a certain degree of mobility of the anchored kidney, undoubtedly present, was fairly attributable to mere stretching of adhesions and laxity of the abdominal walls, or whether the operation must be classed as a failure. The following test was finally evolved in 1892, as the result of much pondering on the subject. The test is based upon the fact that a movable kidney can always be readily pushed upward and caused to disappear beneath the

ribs. In fact, the diagnosis of movable kidney is based upon this ready disappearance upward of the kidney on manipulation. Experience, on the other hand, has taught me that a kidney anchored in the loin after my method of nephropexy, even after the connective-tissue bands holding it have become more or less stretched, can never be returned to its normal situation beneath the diaphragm. Unless, therefore, I can crowd such an anchored kidney upward so as to cause it to disappear beneath the ribs, I regard it as anchored in the loin sufficiently well for all practical purposes.

Judged by the application of this test, not a single one of the kidneys which I have anchored has to my knowledge, based upon personal examination, again become detached. It is true that I reported, in 1895, two failures. In the case of both of these patients the information that the anchored kidney had become detached came from their physician, and I have had no opportunity to either verify or disprove their diagnosis by personal examination. In quite a number of instances in which one or another of my patients has been told by a colleague that a kidney I had anchored had again become detached, I invariably found the organ, on personal examination, securely anchored.

Ever since my first nephropexy, performed on February 8, 1890, I have kept myself profoundly interested in the subject of movable kidney and its treatment. I have especially devoted a great deal of my time and attention to an earnest and truth-seeking study of the ultimate result, anatomic and therapeutic, following my nephropexies. I have sought and found occasion to repeatedly see and examine the large majority of my patients many years after operation, and in only one instance did repeated examination justify a reasonable doubt of the sufficiency of the anchorage of the kidney.

The patient's right kidney was anchored in May, 1899. Two years after operation two physicians of acknowledged diagnostic ability informed her that her kidney was again loose and needed fixation. The kidney could be readily grasped and moved about

within a limited radius, and could even be partly displaced beneath the ribs. A second or repeated nephropexy, performed at the patient's request in June, 1901, showed the kidney so securely and firmly anchored that it could not be detached without breaking the kidney substance. Nothing was done except to slightly increase the area of anchorage, the long and narrow strip of fixation obtained at the first operation permitting of movements of the kidney as if on a hinge, and leading to the erroneous diagnosis of redetachment of the organ.

Upon another patient, whose right kidney I anchored on June 6, 1898, I had occasion very recently to perform a *cœliotomy* for the radical cure of a ventral hernia following an abdominal section by another surgeon. She had been informed by several physicians of high standing that the kidney I had anchored had again become loose. I embraced the opportunity afforded by the *cœliotomy* to introduce my hand, to grasp the anchored kidney, and to satisfy myself of its absolute and immovable fixation to the posterior abdominal wall.

Rose, quoted by Frank, had two experiences similar to the above. Nine months after nephropexy in one of his cases, and two years after nephropexy in another, suspicion arose that the kidney was again loose, because it could be moved somewhat. Exploratory incision—abdominal in one case, lumbar in the other—was made, and settled the fact that both kidneys were securely anchored. The exploratory operation also established the fact that the scar, and with it the kidney, followed the movements of the lax posterior abdominal wall, thus simulating reacquired mobility of the kidney.

I may mention that in the early part of 1898 I undertook a comprehensive investigation of the ultimate results of the nephropexies I had performed up to that date. During this investigation I personally examined no less than fifty-five kidneys which had been anchored from one year up to eight years and three months previously, with an average for the fifty-five kidneys of three years and three months since operation. Fifty of these kidneys were found firmly and solidly anchored; in five the kidney attachments had stretched more or less, or the kidney followed the movements of the lax posterior

abdominal wall. None of them, however, as judged by the test already described, had become detached from its anchorage.

The therapeutic results of nephropexy form a large and interesting subject; too large for discussion at this time, and sufficiently interesting to warrant consideration in a special paper, which I hope to prepare when my investigations shall have been concluded to my full satisfaction. My own present stand-point practically agrees with that taken in the following extract from a letter recently received from Dr. G. B. Johnston: "I wish nephropexy could be made more popular. In the hands of judicious men it is so safe, and when the cases for it are properly chosen I know of no operation which gives more satisfactory results. Unfortunately, it is undertaken by the unripe surgeon when it is not only not required, but its performance is actually harmful. Only after a long experience and close observation can a man decide positively upon which cases to operate and expect relief of symptoms."

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NOTE ON THE DISTRIBUTION OF THE BRANCHES
OF THE INTERNAL ILIAC ARTERY AND
THE ZONES OF EXSANGUINATION
RESULTING FROM ITS DELI-
GATION.

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THE umbilical artery in the new-born extends patent from the origin of the external iliac to the umbilicus. The segment of the umbilical artery, which is known as the hypogastric, extends from the origin of the external iliac to the origin of the internal pudic. This segment remains patent throughout life. The segment of the umbilical artery, which extends from the origin of the internal pudic to the fundus of the bladder, remains partially patent, while the segment extending from the fundus of the bladder to the umbilicus atrophies to a white, impervious cord. With the new-born before the eye the two umbilical arteries pass in contact with the lateral borders of the bladder to converge with the urachus at the umbilicus. In adults these atrophied structures are known as the ligamentum vesico-umbilicale laterale. The obliterated remains of the alantoid, or partially atrophic and impervious urachus, are known as the ligamentum umbilicale medium. In the new-born the hypogastric artery cannot be said to exist, as it is merged into the umbilical. However, with the assumption of extra-uterine life: (*a*) the segment of the umbilical artery extending from the umbilicus to the fundus of the bladder immediately ceases function and slowly obliterates into a white fibrous cord with a considerable sheath of connective tissue. This we will call the *umbilical segment* of the umbilical artery; (*b*) the segment of

the umbilical artery extending from the summit of the bladder to the origin of the internal pudic partially ceases its function. It emits one or two vesical arteries. This we will call the *vesical segment* of the umbilical artery; (c) the segment of the umbilical artery extending from the origin of the internal pudic to the origin of the external iliac is the arteria hypogastrica, and the only portion which remains fully patent in the adult. This we will call the *hypogastric segment* of the umbilical artery, and, according to the present method of anatomic instruction, the arteria uterina is a branch of the arteria hypogastrica. The arteria uterina in the new-born can be injected through the umbilical. This description applies only where the internal iliac has a typical division.

The numerous variations and atypical distributions of the branches of the internal iliac may be noted in some of the accompanying illustrations drawn from my dissections of female subjects.

BRANCHES OF THE UMBILICAL ARTERY.	Anterior Trunk	(1) Arteria iliac externa.	
		(2) Arteria ureterica (medium).	
		(3) Arteria uterina.	
		(4) Arteria vesico-vaginalis.	
		(5) Arteria obturatoria.	
		(6) Arteria pudenda interna.	
		(7) Arteria vesicalis superior.	
		(8) Arteria vesicalis media.	
		(9) Arteria ureterica (distal).	
	<i>Irregular Branches.</i>	(1) Arterial vaginals.	
		(2) Arteria hæmorrhoidalis (median).	
		(3) Arteria vesicalis (inferior).	
		Posterior Trunk.	(1) Arteria glutea superior.
			(2) Arteria ileolumbalis.
			(3) Sacralis laterales superior.
(4) Sacralis laterales superior.			
(5) Arteria glutea inferior.			

The division in the internal and external iliac arteries generally occurs at the level of the lumbosacral joint. The trunk of the internal iliac precedes a variable distance previous to the origin of its peripheral branches. The main branches originate from the trunk of the internal iliac at the proximal border of the foramen ischiadicum major. The length of the trunk in my dissections varied from one-half to one and one-half inches (Jastschinski, from one-half to two and one-quarter inches). Frequently the trunk is so short that two ligatures could not be applied with severing of the artery between them. The internal iliac divides into two branches,—an anterior (ventral) and a posterior (dorsal). The anterior branch passes ventrally to divide into a variable number, one of which is the pelvic floor segment of the utero-ovarian artery.

The dissections showed that the internal may be a trunk of about one-half inch, and presents a point from which a whorl of arterial branches originate. The *posterior branch* passes dorsally, and usually consists of the superior gluteal, ileolumbar inferior gluteal, and lateral sacral arteries.

The *anterior branch* of the internal iliac is the chief one of interest to the gynæcologist, as from it arises the uterine artery. The chief variation exists in the anterior branch, which mainly consists in the varying origin, length, distribution, and size of its branches. If one adopts a typical scheme, and attempts to draw the consecutive dissections by it, he will find a lack of definite arrangements in the branches in the anterior trunk.

The branches of the internal iliac that remain fairly constant are the superior vesicals and the uterine, in the anterior trunk. However, the origin of the uterine is variable, in 30 per cent. of subjects arising from the pudic. The inferior gluteal, pudic, and especially the vaginales, are quite variable. In my dissections the variations extended to the different sides of the same individual.

In the posterior trunk the superior gluteal was constant in every subject dissected. In all dissections, one fact stands prominent, namely, the variability in size, origin, and divi-

sions of the anterior branch of the internal iliac artery. It is rarely of surgical length, and having once ligated it one does not know with certainty what territory is exsanguinated. The pelvic floor segment of the utero-ovarian artery (the uterine) can be ligated at any point, internal or external to the ureter, as far as its origin. But the variability of the branches of the anterior trunk compels the operator to sacrifice the whole branches by ligating the trunk to exsanguinate with certainty any single territory. The operator must remember the uncertain length and numerous anomalies of the anterior trunk. The internal iliac artery at its origin rests in a groove with the psoas muscle to the external side and the common iliac vein posterior and internal. It crosses the external common iliac vein and proceeds into the lesser pelvis in company with the internal iliac vein. The vessel lies immediately beneath the peritoneum, and hence can be easily approached.

A very important matter in regard to the internal iliac artery is that the ureter lies in close relation with it from origin to its division. In some cases the ureter lies in actual contact with the whole length of the artery. The ureter usually lies in close relation with the anterior branch of the internal iliac artery as far as the origin of the uterine, along which it courses, mainly parallel and frequently in actual contact to the *distal arterio-ureteral crossing*. In some cases the ureter must be dissected not only from the internal iliac artery, but from the external two-thirds of the pelvic floor segment of the utero-ovarian artery. Toldt's Atlas contains very accurate cuts in regard to the relation of the ureter and uterine artery, with which must be mentioned the excellent monographs on the uterine artery of Drs. Nagel, Broeckaert, Davidsohn, and Fredet.

In some cases where the uterine artery arises well ventrally from the umbilical, the ureter may lie one-quarter to one-half inch distal to the internal iliac. The ureter thus forms the hypotenuse of a triangle of which the base is the umbilical and the side is the uterine artery. Variations of divisions and origins in the anterior branch of the internal iliac produces

varied relations with the ureter. Dissections show that neither the internal iliac artery nor the ureter are constant in location or in relation to each other. Besides, the artery and ureter are not fixed in relations to any intraperitoneal structure.

The surgical importance lies in the intraperitoneal relations of the uterine (and internal iliac) with the ureter. Though the uterine artery and ureter are not bound together in the same subperitoneal sheath, yet, when in close relations, which is frequently the case, they move together to some extent in the general subperitoneal bed.

Practically, the umbilical artery or the internal iliac of English anatomic text-books is of supreme importance as regards its topographic relations in the pelvic viscera. For example, the internal iliac artery supplies three systems of viscera in the pelvis, viz. (1) *Ventrally* in the pelvis lies an important segment of the tractus urinarius as the distal end of the ureter, the bladder, and the urethra, which are supplied mainly by the vesical arteries. (2) In the *centre* of the pelvis lies the tractus genitalis, as the uterus, oviducts, and ovaries, which are chiefly supplied by the utero-ovarian artery. (3) *Dorsally* in the pelvis lies a segment of the tractus intestinalis, as the rectum practically supplied by the middle and inferior hæmorrhoidal vessels.

The *first factor* of importance as regards the internal iliac artery is the capacity it presents to the operator of exsanguinating definitely any or all of the pelvic viscera by ligature. The *second factor* presented is the capacity of the operator to ligate with certainty any one of its branches without damage to adjacent structures as the ureter.

The *third factor* is that certain branches (as the utero-ovarian) present at their periphery of bilateral anastomoses limited exsanguinated zones, which may be utilized in surgery without ligature or clamp, e.g., the longitudinal central axis of the uterus, the fundus, and the lateral cervical borders present exsanguinated zones supplied by capillary vessels only. The final utility of the internal iliac artery to the surgeon will depend on whether the artery has a constant distribution which

would enable the operator to exsanguinate by ligature with precision any or all the pelvic viscera.

Unfortunately, the distribution of the branches of the internal iliac is irregular; and hence the operator cannot exsanguinate by ligature with certainty any definite pelvic visceral area. The only ligature which will exsanguinate any pelvic visceral territory with certainty is the one which will exsanguinate all the pelvic viscera, *i.e.*, a ligature on the trunk of the internal iliac.

The great and painstaking work of S. Jastschinski (*International Monatschrift für Anatomie und Physiologie*, Bd. viii, 1891), who dissected 1034 half pelves, has demonstrated for all time the irregularity in size, origin, and peripheral distribution of the internal iliac artery. Pryor dissected seven subjects, and I dissected over twenty subjects for the purpose of observation of size, origin, and distribution of the internal iliac artery. I found great variations in every one of my subjects.

The object of knowing exactly the origin, distribution, and topographic relations of the internal iliac artery is to remove all adjacent disease in operative procedures, or to starve what tissues cannot be removed by its vascular ligation.

There is no certainty in exsanguinating definite pelvic fields by ligature of the anterior branch of the internal iliac. By ligating the internal iliac trunk only two more important definite branches will be sacrificed, *viz.*, the gluteal superior and inferior.

By ligating the internal iliac trunk, the uterus, bladder, and vagina are directly exsanguinated, and become indirectly supplied by the superior hæmorrhoid and some small branches ventrally located. Atrophy, starvation, and more or less necrosis of tissue will undoubtedly occur; yet it is the only and last chance in pelvic visceral malignancy.

Ligating the pelvic floor segment of the utero-ovarian artery near its origin might include the internal pudic; and, besides, ligating the uterine arteries does not exsanguinate the bladder, rectum, or vagina. The chief origins of the uterine

artery are first from the umbilical (hypogastric) or from the internal pudic.

The relations of the ureters are important to the great iliac vessels over which they pass to course along the pelvic wall and floor to the bladder. In general, the right ureter crosses the vessels more distal than the left, and also the angle for the right ureter, *flexura iliac ureteris*, is greater than the left. On account of the right ureter crossing the iliac vessels more distal, one observes more frequently the right ureter on the arteria iliac externa and the left ureter on the arteria iliac communis. Whatever the division points of the arteria iliac communis, the rule is that the right ureter crosses more distal and the left more proximal, hence the left ureter lies nearer the median line than the right. This variation of the ureteral crossing on the common iliac causes the ureteral relations to vary with the internal iliac. The ureter in general lies (*a*) posterior, (*b*) anterior, or (*c*) internal to the internal iliac artery, which should be remembered when ligating the trunk of the internal iliac. The variations of the relations of the ureter to the arteries is due to the variation of the divisions of the abdominal aorta, the common and internal iliacs. The trunk of the internal iliac or hypogastric is short (one-half to one and one-half inches). It is not so large as the external iliac. The direction of the internal iliac is distalward and dorsalward on the proximal circumference of the great sacro-sciatic foramen. Its proximal end lies on the medial psoas surface and also on the sacro-iliac articulation.

In the foetus the umbilical artery is double the size of the external, and appears to be the direct continuation of the aorta. After ligature of the umbilicalis in the infant, atrophy occurs as far as the exit of the superior vesicle artery. Partial atrophy also arises more proximalward until the umbilicalis appears as a branch only of the external iliac.

The internal iliac, umbilicalis, divides into anterior and posterior branches, which become distributed to the pelvic wall and pelvic viscera. The anterior trunk contains the branches for the pelvic viscera, as the vesicles, uterine, vaginales, hæmorrhoidals.

DESCRIPTIONS OF ILLUSTRATIONS.

FIG. 1 shows a right lateral view of the relations of the ureter and pelvic floor segment of the utero-ovarian artery in a sexually active adult; also the division and distribution of internal iliac. It is fairly typical.

1. The middle arterio-ureteral crossing; 2. Distal arterio-ureteral crossing; 2. Arterio-ureteral loop. Note that the distal arteria ureterica is emitted proximal to the distal arterio-ureteral crossing; 3. Distal (pelvic) ureteral spindle (urinal reservoir); 4. Middle arteria ureterica; 5. External iliac; 6. Internal iliac; 8. Superior gluteal; 10. Inferior gluteal; 12. *Cervical*



loop or internal portion of the pelvic floor segment; 13. Vesicle artery; 16. Obturator; 17. Hypogastric; 18. Uterus; 19. Bladder; 20. Rectum; 21, 22, 23. Sacral plexus. A. External portion of the pelvic floor segment with its relation to the ureter showing a not unusual arterial curve with its concavity proximalward.

Note that in this case the ureter on the right side courses over the external iliac and anterior to the internal iliac; 4 shows the main proximal or lumbar ureteral spindle (urinal reservoir). Observe how a traction-forceps placed on the cervix would extend, unfold, the cervical loop (12)

so that it could be ligated without wounding the ureter. Besides, observe how in Pratt's operation the rami laterales uteri may be severed without severing the uterine segment of the utero-ovarian artery.

In attempting to exsanguinate any of the pelvic viscera for malignancy, as urinary (anterior viscera), genitals (middle viscera), or rectum (posterior pelvic viscera), it is evident, from the uncertain number, origin, and distribution of the branches of the internal iliac, that no definite territory can be exsanguinated without sacrificing all its branches by ligation of the trunk of the internal iliac.

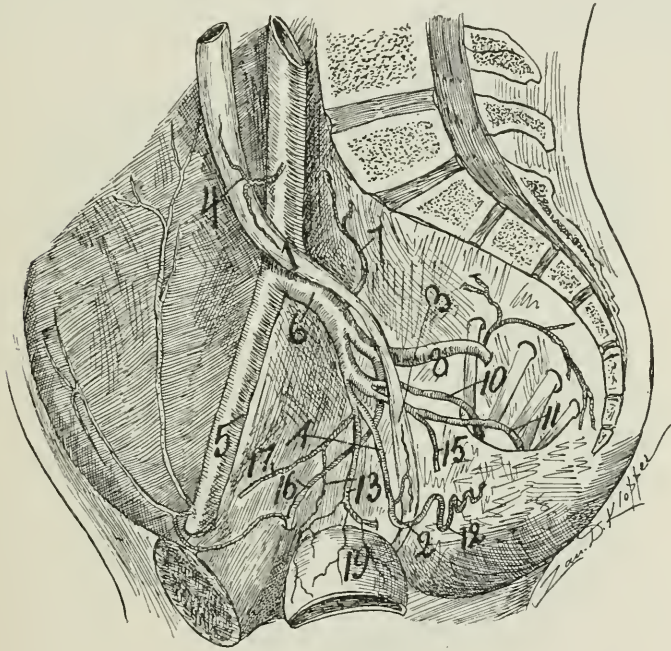


FIG. 2 illustrates a right view of the pelvis to show the relations of the pelvic floor segment of the utero-ovarian artery to the ureter; also the divisions and distributions of internal iliac.—1. The middle arterio-ureteral crossing (entirely on the common iliac); 2. The distal arterio-ureteral crossing from which entirely proximal springs the distal arterio-ureterica, T-shaped; 3. Distal or pelvic spindle of the ureter (urinal reservoir); 4. The middle arteria ureterica arising from the common iliac, T-shaped, also proximal or lumbar ureteral spindle (urinal reservoir); 5. External iliac; 6. Internal iliac; 7. The ileolumbalis; 8. Superior gluteal; 10. Inferior gluteal; 11. Internal pudic; 12. *Cervical loop* or internal portion of pelvic floor segment; 13. Vesicle arteries. 15. Middle hæmorrhoidal; 16. Obturator; 17. Hypogastric; 19. Bladder.

Observe that the ureter courses posterior, dorsal, to the internal iliac in this case, and that A (the external portion of the pelvic floor segment)

makes its usual dorsally looped concavity. The branches of the internal iliac vary in number, size, and distribution, while also the ureter varies in its course as regards the internal (and external iliac); hence scarcely do any two cadavers present exactly similar relations of ureter and pelvic floor segment of the utero-ovarian artery.

I sketched this drawing carefully at my dissection, so that it represents approximately exact anatomic data. In this figure the anterior trunk of the internal iliac is not sufficient in length to place a double ligature for the purpose of exsanguinating the pelvic viscera supplied by the anterior division of the internal iliac. Hence, here the only safe method for pelvic visceral exsanguination (as for malignancy) would be to dissect away the ureter and ligate the trunk of the internal iliac.

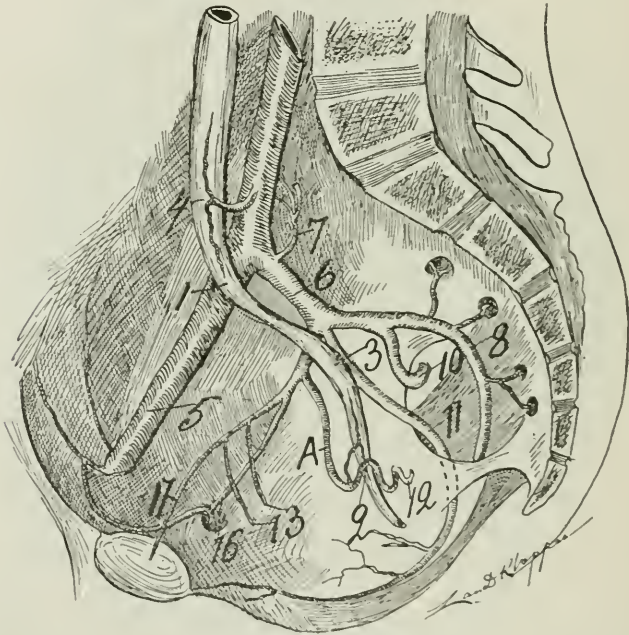


FIG. 3 illustrates a right lateral view of the pelvis to demonstrate the relations of the ureter and pelvic floor segment of the utero-ovarian artery; also the divisions and distributions of internal iliac.—1. The middle arterio-ureteral crossing where the ureter crosses entirely on the external iliac. 2. Distal arterio-ureteral crossing with the arterio-ureteral loop. Note that the distal arteria ureterica springs from the artery close to the point where the uterine artery crosses the ureter. 3. The distal (pelvic) spindle (urinal reservoir); 4. Middle arteria ureterica proximal, to which is the proximal or lumbar ureteral spindle (urinal reservoir); 5. External; 6. Internal iliac; 7. Ileolumbar; 10. Gluteal superior; 8. Gluteal inferior; 11. Internal pudic; 12. Cervical loop or internal portion of pelvic floor segment; 13. Vesicle arteries; 16. Obturator; 17. Hypogastric.

Note that the ureter lies anterior to the internal iliac. The distal arterio-ureteral crossing and the distal end of the ureter appear in the cut to be rather too far dorsal, but dissections, as my own, showed a wide variation. The subject was in the dorsal position and the rectum empty. A. Pelvic floor segment of the utero-ovarian artery quite parallel to the ureter.

To exsanguinate any pelvic visceral territory in this case for malignancy, it would be necessary to ligate (6) the internal iliac trunk. In this case the anterior branch of the internal iliac is insufficient in length to have two ligatures applied and severed between them. Besides, the pudic and pelvic floor segment of the utero-ovarian artery would require separate ligatures.

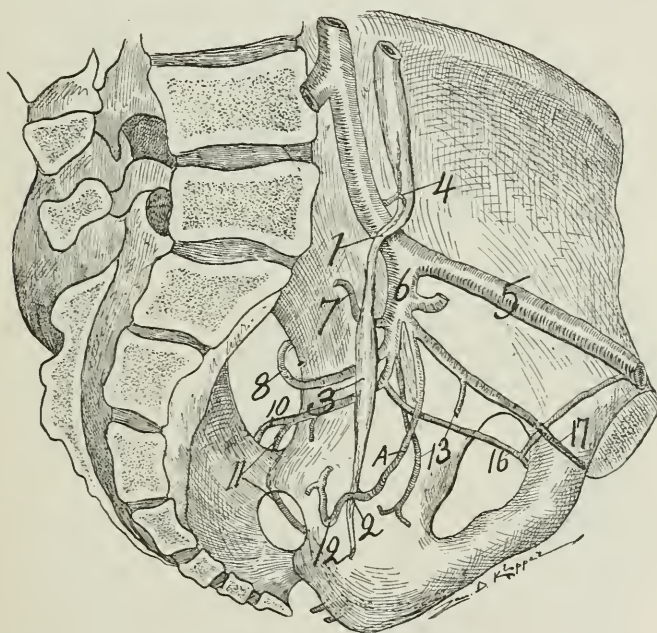


FIG. 4 illustrates a left lateral view of the pelvis to demonstrate the relations of the ureter and pelvic floor segment of the utero-ovarian artery; also the divisions and distributions of the internal iliac. I sketched this drawing from my own dissection.—1. Middle arterio-ureteral crossing; 2. Distal arterio-ureteral crossing, at which point is emitted the distal arteria ureterica, T-shaped. 3. Pelvic (distal) ureteral spindle (urinal reservoir); 4. Arteria ureterica media, T-shaped, and supplying the lumbar ureteral spindle (urinal reservoir); 5. External iliac; 6. Internal iliac; 7. Ileolumbar; 8. Superior gluteal; 10. Inferior gluteal; 11. Internal pudic; 12. *Cervical loop* or internal portion of pelvic floor segment; 13. Vesicle arteries; 16. Obturator; 17. Hypogastric. The distal arterio-ureteral crossing and distal end of the ureter drawn well dorsalward, but the sketch was made from a cadaver lying on the back with empty rectum

and bladder. A. Pelvic floor segment of the utero-ovarian artery. Note in this drawing that the ureter crosses the common iliac and passes entirely dorsal to the internal iliac. Observe the whorled condition of the branches of the internal iliac. In this case no definite pelvic visceral territory could be exsanguinated by ligature except the whole pelvic viscera, as only the trunk of the internal iliac could be ligated.



FIG. 5 illustrates a right lateral view of the pelvis to demonstrate the relations of the ureter to the pelvic floor segment of the utero-ovarian artery; also the divisions and distributions of the internal iliac.—1. Middle arterio-ureteral crossing; 2. Distal arterio-ureteral crossing with its distal arteria ureterica and arterio-ureteral loop; 3. Pelvic (main distal) ureteral spindle (urinal reservoir); 4. Arteria ureterica media springing from the ileolumbar (7); 5. External iliac; 6. Internal iliac. The uterine segment of the utero-ovarian artery is shown from its distal bifurcations to 10. 8. Superior gluteal; 10. Inferior gluteal; 11. Internal pudic, which also emits the middle hemorrhoidal; 12. *Cervical loop* or internal portion of the pelvic floor segment of the utero-ovarian artery; 13. Vesicle arteries;

16. Obturator; 17. Hypogastric; 18. Outline of uterus. This drawing I sketched from a dissection. Observe that the ureter crosses the external iliac and lies ventral to the internal iliac. A. Pelvic floor segment of the utero-ovarian artery which lies parallel and in contact with the ureter for two inches. It shows the usual curve with the dorsal concavity.

From noting this cut, it is evident that no definite territory of the pelvic viscera, anterior, central, or posterior pelvic viscera can be definitely exsanguinated without sacrificing all the branches of the trunk of the internal iliac; 6, the internal iliac is insufficient in length to apply a double ligature. In this case the pudic and obturator arise from the inferior gluteal. The origin, number, and distribution of the branches of the internal iliac are uncertain, as are also the relations of the ureter.

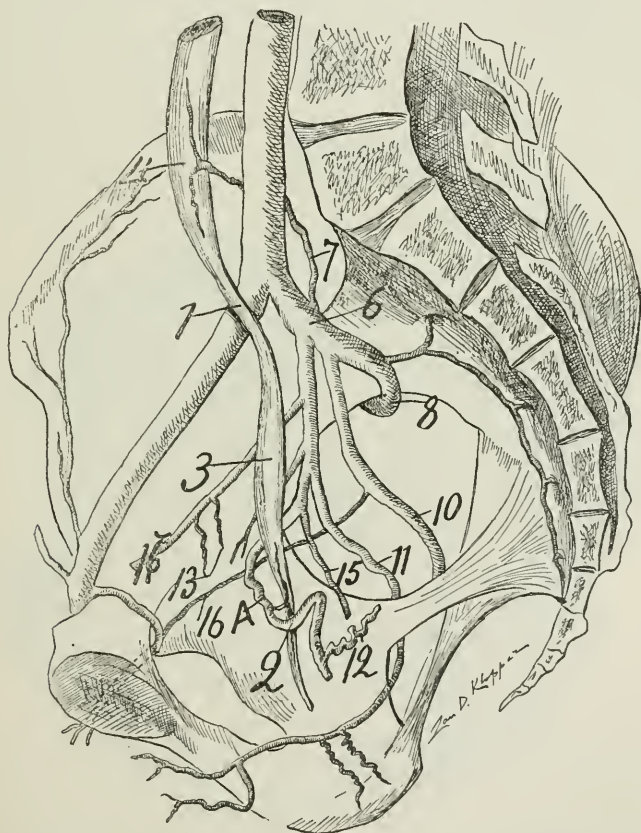


FIG. 6 illustrates a right view of the pelvis to demonstrate the relations of the ureter to the pelvic floor segment of the utero-ovarian artery; also the divisions and distributions of the internal iliac.—I. Middle arterio-

ureteral crossing; 2. Distal arterio-ureteral crossing with the distal arteria ureterica and the arterio-ureteral loop. 3. The distal or pelvic ureteral spindle (urinal reservoir); 4. The middle arteria ureterica springing from the internal iliac; 6. Internal iliac; 7. Ileolumbar supplying the ureter at 4; 8. Superior gluteal; 10. Inferior gluteal; 11. Internal pudic; 12. *Cervical loop* or internal portion of the pelvic floor segment of the utero-ovarian artery. 13. Vesicle arteries; 15. Vaginal and perhaps middle hæmorrhoidal from uterine; 16. Obturator; 17. Hypogastric. I drew the ureteral and vascular relations from a dissection. Observe that the ureter crosses the common iliac and lies anterior, ventral, to the internal iliac, 6. Note that the obturator arises from the inferior gluteal. A. The pelvic floor segment of the utero-ovarian artery with its usual curve and its proximal concavity. In this case the anterior branch of the internal iliac is long enough to ligate without disturbing the posterior. The ligation would exsanguinate bladder and internal and external genitals, as it would include the internal pudic. However, the obturator arises from the inferior gluteal, and would not be disturbed.

The irregularity in origin, size, number, and distribution of the branches of the internal iliac is a striking factor in attempting to exsanguinate any definite territory of the anterior, central, or posterior pelvic viscera by ligation.

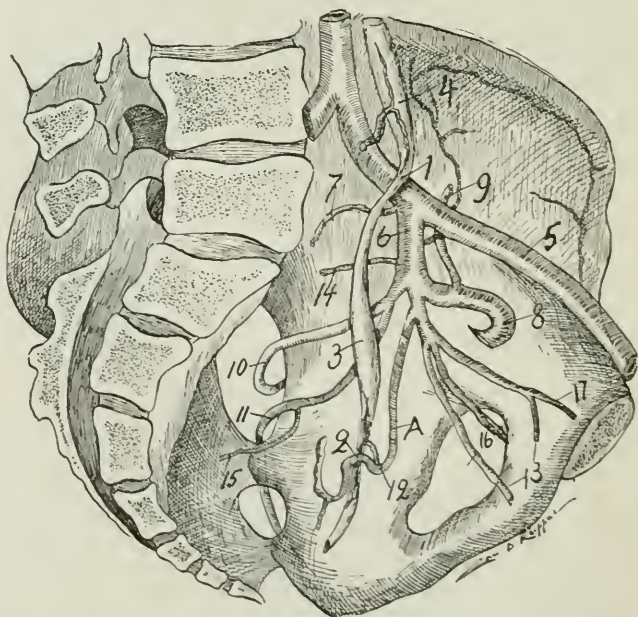


FIG. 7 illustrates a left lateral view of the pelvis to demonstrate the relations of the ureter and pelvic floor segment of the utero-ovarian artery, and also the territories of the pelvic viscera which can be exsanguinated by ligatures of the branches of the internal iliac trunk. It also demonstrates

the division and distribution of the internal iliac.—1. Middle arterio-ureteral crossing; 2. Distal arterio-ureteral crossing with the distal T-shaped arteria ureterica emerging closely adjacent as well as the arterio-ureteral loop; 3. Pelvic (distal) ureteral spindle (urinal reservoir); 4. Middle arteria ureterica supplying the proximal (lumbar) ureteral spindle (urinal reservoir); 5. External iliac; 6. Internal iliac; 7. A sacral artery; 8. Superior gluteal; 9. Ileolumbalis; 10. Inferior gluteal; 11. Internal pudic; 12. *Cervical loop* (the number 12 should be dorsal to the ureter); 13. Vesicle arteries; 14. A sacral; 15. Middle hæmorrhoidal; 16. Obturator; 17. Hypogastric. It is plainly evident from this drawing, from a careful personal dissection, that no definite area of pelvic viscera can be exsanguinated by ligation of branches of the internal iliac on account of the irregularity of the origin, number, and distribution of the branches of the trunk of the internal iliac. The trunk alone through ligation will exsanguinate definite viscera. Observe that the ureter crosses the common iliac, courses dorsal to the internal iliac, and quite parallel to A, the pelvic floor segment of the utero-ovarian artery.

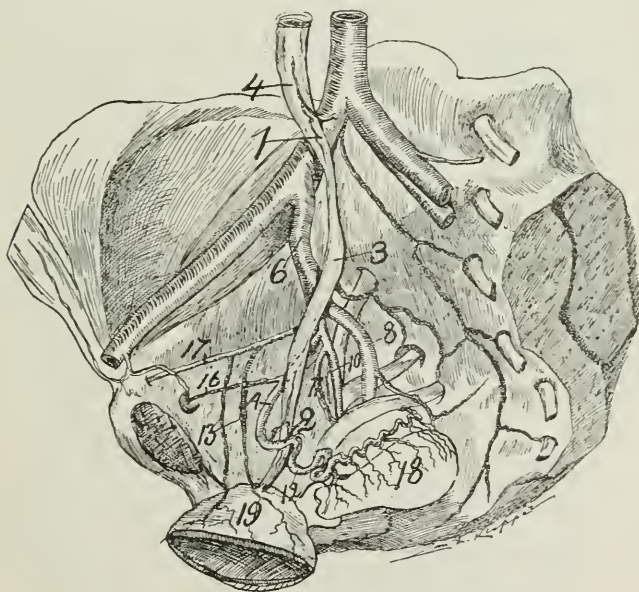


FIG. 8. A cut to illustrate the right wall of the pelvis in order to demonstrate vascular and ureteral relations as well as to what pelvic visceral territories may be exsanguinated by ligations of branches or trunk of the internal iliac. It shows the division and distribution of the internal iliac. In this cut the sacrum is preserved to show further relations.—1. Middle arterio-ureteral crossing; 2. Distal arterio-ureteral crossing with its arterio-ureteral loop and distal arteria ureterica. 3. Pelvic distal ureteral spindle (urinal reservoir); 4. Arteria ureterica media supplying

the proximal or lumbar spindle (urinal reservoir); 6. Internal iliac; 8. Superior gluteal; 10. Inferior gluteal; 11. Internal pudic; 12. *Cervical loop* or internal portion of the pelvic floor segment of the utero-ovarian artery; 13. Vesicle arteries; 16. Obturator; 17. Hypogastric; 18. Uterus with uterine segment and rami laterales uteri in typical blood supply; 19. Bladder.

This cut shows that on account of the irregularity of origin, number, and distribution of the branches of the internal iliac no definite pelvic visceral territory can be exsanguinated without ligating the trunk of the internal iliac, and thus sacrificing all of its branches.

Note that the ureter crosses the common iliac, courses dorsal to the internal iliac, and does not lie parallel to the pelvic floor segment of the utero-ovarian artery. The ureter crosses the uterine artery twice in this cut, once ventral and once dorsal to A., the uterine artery. In such cases the ureter is easily dissected from the artery. A. Pelvic floor segment of the utero-ovarian artery with the usual curve, convexity proximalward.

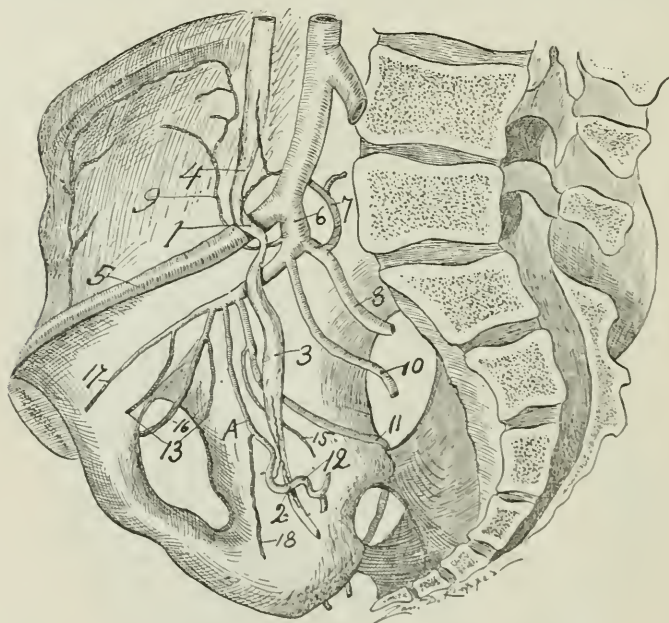


FIG. 9. A cut to illustrate the right wall of the pelvis in order to demonstrate vascular and ureteral relations as well as to what pelvic viscera territories may be exsanguinated by ligations of branches or trunk of the internal iliac. It also demonstrates the division and the distribution of internal iliac. In this cut the sacrum is preserved to show further relations.—1. Middle arterio-ureteral crossing; 2. Distal arterio-ureteral crossing with its arterio-ureteral loop and distal arteria ureterica; 3. Pelvic distal ureteral spindle (urinal reservoir); 4. Arteria ureterica media

supplying the proximal or lumbar spindle (urinal reservoir); 6. Internal iliac; 7. Ileolumbar; 8. Superior gluteal; 9. Ileolumbar; 10. Inferior gluteal; 11. Internal pudic; 12. *Cervical loop* or internal portion of the pelvic floor segment of the utero-ovarian artery; 13. Vesicle arteries; 16. Obturator; 17. Hypogastric; 18. Vaginal.

This is an interesting sketch from my personal dissection of a woman about fifty-five. The arteries were well injected, and I injected red lead and starch in the ureter; all were dissected and drawn *in situ*.

Note that one vesicle originates from the hypogastric and one from the obturator. The trunk of the internal iliac is so short that it would be difficult to ligate. Hence, again, this cut shows that on account of the irregularity of origin, number, and distribution of the branches of the internal iliac no definite pelvic visceral territory can be exsanguinated without ligating the internal iliac, and thus sacrificing all of its branches.

Note the kink or short bend that occurs in the ureter between the internal iliac and internal iliac vessels. Observe that this ureter crosses the external iliac, courses anterior to the trunk of the internal iliac and dorsal to the pudic. The ureter lies parallel to the pelvic floor segment of the utero-ovarian artery for two inches. A. Pelvic floor segment of the utero-ovarian artery with scarcely any curve, parallel for two inches to the ureter, but not in contact.

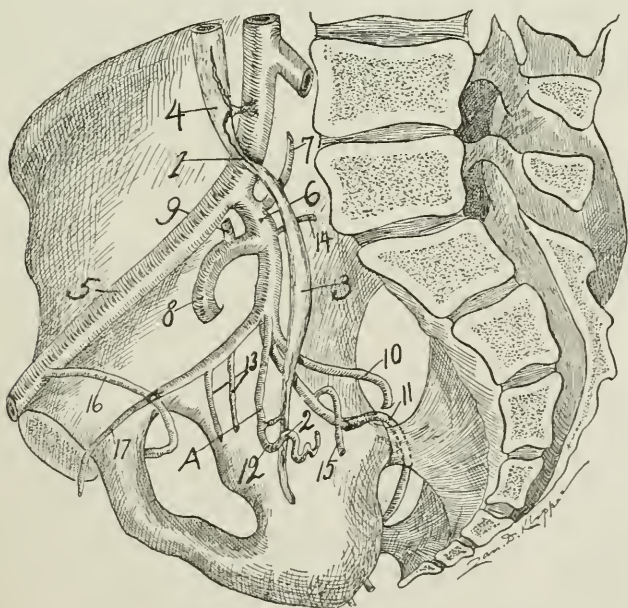


FIG. 10. A cut to illustrate the right wall of the pelvis in order to demonstrate vascular and ureteral relations as well as to what pelvic visceral territories may be exsanguinated by ligations of branches or trunk of the internal iliac. It also demonstrates the divisions and distribution of

the internal iliac. In this cut the sacrum is preserved to show additional relations.—1. Middle arterio-ureteral crossing; 2. Distal arterio-ureteral crossing with its arterio-ureteral loop and distal arteria ureterica; 3. Pelvic or distal ureteral spindle (urinal reservoir); 4. Arteria ureterica media supplying the proximal or lumbar spindle (urinal reservoir); 6. Internal iliac; 7. Ileolumbar; 8. Superior gluteal; 9. Ileolumbar; 10. Inferior gluteal; 11. Internal pudic; 12. *Cervical loop* or internal portion of the pelvic floor segment of the utero-ovarian artery; (12 should be median to the ureter); 13. Vesicle arteries; 16. Obturator; 17. Hypogastric.

This cut shows that on account of the irregularity of origin, number, and distribution of the branches of the internal iliac no definite pelvic visceral territory can be exsanguinated without ligating the trunk of the internal iliac, and thus sacrificing all of its branches. Note that in this case the ureter crosses the common iliac, courses dorsal to the internal iliac parallel on a curve and in contact, and finally passes parallel to the uterine for a little over an inch.

One could ligate the vessels in this case and save the superior gluteal. A. The uterine in this case is short on account of the peculiar trunk of the internal iliac separating the origins of the superior and inferior gluteals by a long stretch.

Number 12 should be on the median side of the ureter; 15. Middle hæmorrhoidal. A. The pelvic floor segment of the utero-ovarian artery in this cut is the shortest of all the dissections, of which this is a careful drawing sketched from the subject *in situ* with ureter filled by red lead and starch.

LIGATION OF THE ABDOMINAL AORTA FOR ANEURISM.¹

BY ROBERT T. MORRIS, M.D.,

OF NEW YORK.

THIS is the fourteenth case in which the abdominal aorta has been ligated and the operation recorded. All of the patients have died, but there is evidence that the operation may be successfully accomplished in the near future. Ten of the operations were done before the days of antiseptic methods in surgery, and almost all of these patients died within a few hours of the operation. Of the four ligations of the aorta, done presumably under antiseptic precautions, Dr. Keen's patient lived for forty-eight days, Dr. Tillaux's patient for twenty-nine days, while Dr. Milton's patient died suddenly on the day after operation from "anæmia and shock."

My patient died of septicæmia on the third day after operation. I will append notes of the thirteen other cases, and in reporting my own case here merely quote the salient points that have value from a surgical point of view. The voluminous notes of the full record are on file among the records of cases at the New York Post-Graduate Hospital.

The patient was a colored woman, twenty-four years of age. She gave no history of syphilis, but a post-mortem examination of the aorta showed atheroma that was evidently syphilitic in character. She also had suppurative nephritis of the left kidney, caused by the ulceration of large nodules of gumma in the kidney.

She entered the Post-Graduate Hospital on April 30, 1901, with a history of aortic disease dating back four months. At first there had been constant pain in the right epigastrium, and she

¹ A paper read at the meeting of the New York State Medical Society on October 16, 1901.

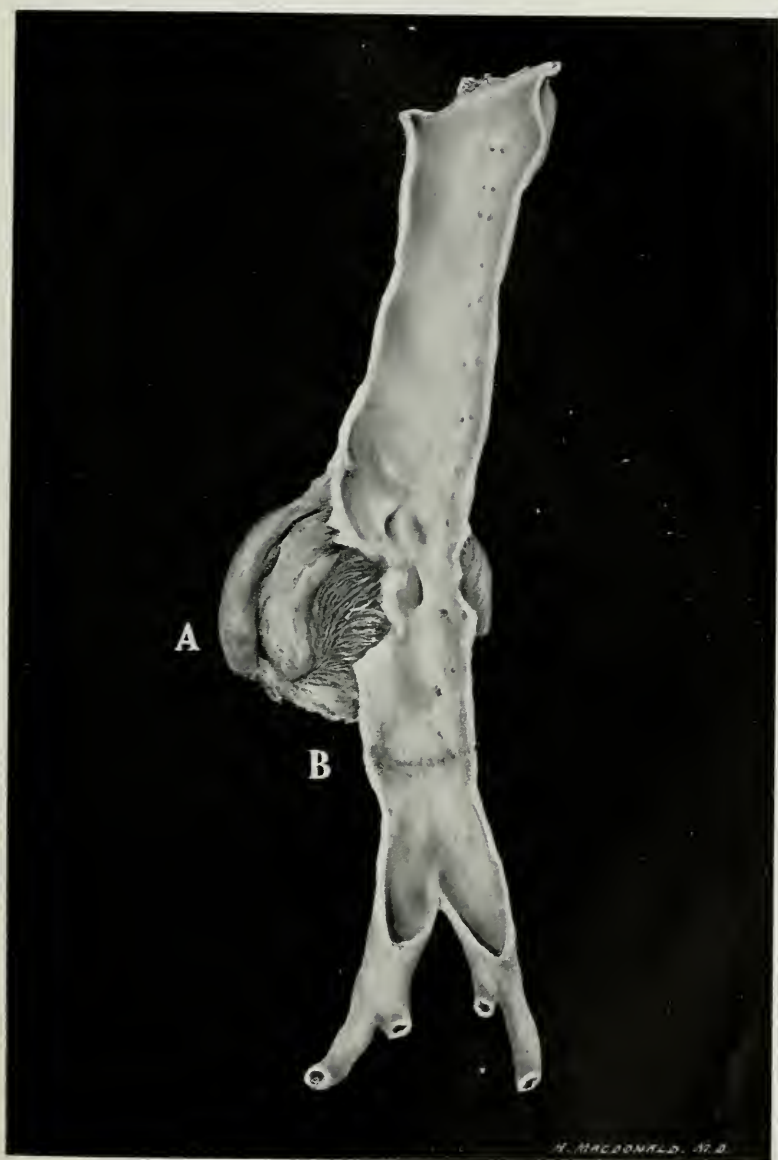
had been treated for gastritis and pleuropneumonia at two New York hospitals at a time when a diagnosis of the real condition must have been difficult, if not impossible. The epigastric pain was accompanied by vomiting so severe and so continuous that at the end of two months she was too feeble to walk. At about this time she began to notice a pulsating tumor in the epigastrium which rapidly increased in size.

The record of vital signs shows that on entrance to the hospital her temperature was 100° F., pulse 80, and respirations 26; there was a mitral regurgitant murmur of the heart; her lungs were normal; urine loaded with pus, albumen, and casts. Examination of the abdomen showed on inspection an epigastric tumor pulsating so forcibly that the pulsations were visible at a considerable distance from the patient, and the objective signs of aneurism of the aorta were typical of that condition.

The operation of ligation of the aorta was done on the afternoon of May 1, 1901, at 1.30 o'clock. A six-inch incision was made from the ensiform cartilage down to the umbilicus. The aneurismal sac apparently extended at its base from the coeliac axis to a point caudad from the mesenteric vessels. My plan was to employ temporary ligation of the aorta in order to allow the sac to fill with clots, and then to remove the ligature and allow the circulation in the extremities to continue as before.

For purposes of ligation I chose a soft rubber catheter about twelve millimetres in circumference, in order to avoid injury of the tunica intima. The aorta having been isolated from surrounding structures for a short distance, the catheter was carried around it with the aid of an aneurism-needle threaded with a loop of silk. The loop of catheter surrounding the aorta was then drawn tightly until circulation in the femoral arteries ceased, and a long clamp forceps held the catheter in place. This avoided tying. The ends of the catheter and of the forceps were allowed to protrude from the abdominal wound, which was sutured with the exception of room for the ligating apparatus. The ligature was applied at a point about two inches caudad from the aneurism and one and a half inches cephalad from the bifurcation of the aorta.

The operation required thirty minutes in time, the larger part of which was expended in controlling hæmorrhage from the numerous vessels in the subperitoneal tissues about the aorta. The



Interior view of thoracic and abdominal aorta showing involvement of wall from coeliac axis to mesenteric arteries in an aneurismal sac. A. Sac filled with firm clots. B. Break in tunica intima which developed after specimen had been hardened in formalin and alcohol, but which was not apparent in the fresh specimen at the site of the ligature.

operation may be done in about fifteen minutes by one who is fairly skilful.

At the moment of tightening the ligature about the aorta the patient's pulse went to 148 and respirations to 48; the pulse at the wrist became hard and throbbing; the patient's skin was warm and moist. One and one-half hours after operation the pulse was 120, respirations 48. Three hours after operation the temperature was 98.5° F., pulse 120, respirations 60. Nine hours after operation the balance between the vital signs was restored, with a temperature at 100°, pulse 104, and respirations 36. Nine hours after the operation the patient's legs became warm for the first time, although the bed had been arranged with hot bottles immediately after the operation. The patient complained of intense pain in the legs and a feeling of numbness. The pain was so great as to require the use of morphine, and even this did not give her much relief.

I had intended to keep a record of the excretion of urine, but, as urine and fæces were both lost by involuntary movements, the record cannot be accurate. Nineteen hours after the operation the patient could feel the prick of a pin over the vastus muscles, but the legs showed general loss of sensation. Twenty-two hours from the operation, the heaving, expansile pulsation of the aneurism suddenly began to diminish while I was palpating it, and it diminished so rapidly in size that when I returned about an hour later for further examination the tumor seemed to have diminished at least one-half in size. In about three hours the aneurism had apparently disappeared. Twenty-seven hours after the operation I removed the ligature from the aorta by uncoupling the forceps and drawing out the catheter. Immediately on removing the ligature the pulse went to 140 and was rapid and irregular, but dropped quickly to 60, with regular pulsations. The pulsation in both femorals showed that circulation in the extremities was restored. Sensation was restored and sphincter control was regained. The patient became very quiet and more comfortable than at any time since the beginning of her trouble. She was feeling very hopeful and had a pleasant chat with her husband, and during the day gave every prospect of a successful outcome of the operation. On the following night, however, she began to develop evidences of intense septicæmia, and died of septicæmia fifty-three hours after operation.

On post-mortem examination it was found that the septicæmia was caused by gangrene of small portions of the bowel which had lain in contact with the steel forceps. This is a danger which I had not anticipated in the case, but which we know sometimes does occur whenever any rigid instrument is left in contact with abdominal viscera. Infection from the gangrenous bowel had extended to a serous collection in the vicinity of the wound, and the patient was overwhelmed with violent septicæmia, which she was unprepared to resist on account of her disabled kidneys, weak physical condition, and lack of nourishment.

The aneurism was found to have been a dissecting aneurism involving the wall of the aorta from the cœliac axis to the mesenteric vessels. It was solidly filled with blood-clots, but leaving a patent aorta. An embolus was found in the left internal iliac artery, but there was no evidence of injury to the aorta at the site of ligation. Some time later, after the aorta had been hardened in formalin and alcohol, the tunica intima showed a tendency to crack at the point where the ligature had been applied.

The case demonstrates that an aneurism of the aorta can be made to fill with clots by the application of a temporary ligature to the aorta, and that circulation in the extremities may be re-established on removal of the ligature.

The records of cases of ligation of the abdominal aorta were compiled by Kast in the *Deutsche Zeitschrift für Chirurgie* in 1879, by Liebrecht in 1885; in the *Journal d'Accouchements*, etc., and by Keen, in 1900, in the *American Journal of the Medical Sciences* for September.

Notes of the cases operated upon to date are here appended.

Astley Cooper. ("Surgical Essays." London, 1828, Part i, p. 201.)—Patient, a man aged thirty-eight.

Indication.—Aneurism of left external iliac. Attempts to compress with the tourniquet had caused pressure-gangrene with erosion of sac and profuse hæmorrhage.

Operation performed June 25, 1817. Incision three inches long, beginning above the navel and avoiding the latter. Opening of peritoneal sac. Finger carried between intestinal coils to spine, locating aorta. Superjacent peritoneum nicked with finger-nail, and vessel tied with aneurism-needle from behind forward.

Immediate Results.—Sensation of cold and disturbed sensibility in

lower extremities. After ten hours, warmth and feeling reappeared on right side. On the following day (patient had been operated on in the evening, 9 P.M.) the condition gave ground for a hopeful prognosis.

In the afternoon a turn for the worse. No peritoneal reaction, but great anxiety and vomiting. Pains in the loins and head.

Temperature of right leg, 94° in the morning, 96° in the evening; of the left leg, 85.5° A.M., 87.5° P.M. On the second day after operation temperature of right side normal, while left leg was livid. The general state became progressively worse; involuntary defecation; condition bordering on collapse; somnolence and death.

Patient lived forty hours after operation.

Autopsy.—Not the least sign of peritonitis. Ligature had been truly applied. External wound had begun to heal. The vessel had been tied one inch above the crossing of the duodenum. A thrombus had formed one inch above and below the ligature.

J. H. James. (*Medico-Chirurgical Transactions*, 1830, Vol. xvi, Part i, p. 1.)—Patient, a man aged forty-four years.

Indication.—A very large aneurism of the internal iliac with threatened rupture. Fruitless attempts had been made to heal the aneurism by ligation of the femoral.

Operation performed July 5, 1829, 2 P.M. Cooper's method essentially followed. Incision longer, extending farther towards symphysis. Opening of peritoneal cavity followed by extensive prolapse of inflated intestines. Very difficult to get through intestinal coils and also to divide posterior peritoneum. Latter had to be transfixed with the needle, which broke during the procedure. Aorta finally tied; prolapsed intestines replaced.

Immediate Results.—When ligature was drawn tight, patient immediately felt a deadness in his legs. Slight collapse requiring stimulants. Pains in limbs despite narcotics. Headache. The temperature of the limbs soon fell below that of the body. Patient complained more and more, and died about four hours after operation.

Autopsy.—Intraperitoneal hæmorrhage of considerable extent. Intestines show no alterations. The aorta had been ligated one inch below the duodenal crossing. The ligature not clean, as the dense fibrous tissue which connected the peritoneum with subjacent parts had been included, also a small lateral twig of the inferior mesenteric vein. Incomplete thrombus formation, both central and peripheral.

John Murray. (*London Medical Gazette*, 1834, Vol. xiv, p. 68; Vol. xv, p. 6.)—Patient, a male aged thirty-three years.

Indication.—Rapidly growing aneurism of the right external iliac, going over into the common iliac.

Operation, January 26, 1834, 11 P.M. Right lateral decubitus. Superficial incision in left side, extending from end of tenth rib to one inch before anterior superior spine of the ilium. Incision about six inches long, convex behind. Dissection to peritoneum. Latter not opened, but detached by the hand from the spine and the iliopsoas fascia. Aorta found, isolated with finger-nail and elevator, surrounded with aneurism-needle, and tied. Little blood lost.

Immediate Results.—No disturbance of any sort when ligature was

tightened. Collapsed for fifteen minutes after operation. The hitherto healthy left limb began to feel numb and helpless. Vesical tenesmus persistent. Patient could move either leg at will. Finally fell asleep.

On the following day violent pains set in in both limbs and pubic region. Right leg, 89.5° ; left, 88.5° ; axilla, 98° . Pulse 120, even. No sign of peritoneal reaction. Headache, with tense carotids. Radial pulse hardly perceptible. Anxiety, cold sweats. Both legs cold, anæsthetic. Collapse and death. Patient lived twenty-three hours after operation.

Autopsy.—Peritoneum healthy. Some organic disease of bladder. Aorta had been ligated between three and four inches above bifurcation. Melted wax had been thrown into the thoracic aorta. Abdominal aorta contained wax up to one and one-half inches of ligature. Omentum, mesentery, and intestines finely injected with wax. In only one locality was there evidence of anastomosis to form collateral circulation (inferior mesenteric with internal iliac). Aneurism becoming gangrenous.

B. C. Monteiro. (*Lancet*, 1842, Vol. i, p. 334.)—Patient, a man aged thirty years.

Indication.—Aneurism of right femoral, which, however, had been diagnosed during life as aneurism of the external iliac.

Operation performed August 5, 1842, at 2 P.M. Position right lateral, with legs extended. Incision of soft parts from free end of last rib to anterior superior spine of ilium. Tissues divided down to peritoneum. Patient then placed upon his back and the shoulders and pelvis both elevated to lower intra-abdominal pressure. Peritoneum then carefully detached from subjacent structures. An assistant introduced his hand to make retraction and the operator ligated the aorta, one end of the ligature being allowed to emerge from the external wound.

Immediate Results.—No collapse, but sweating, slight dyspnoea, and pulse small though regular. The legs chilly for a few hours, but became even warmer than originally. On the first day the chief symptoms were thirst and dyspnoea; the day following operation restlessness and vomiting added, and later in the day quick pulse and abdominal pain. Second day after operation became comfortable, but had slight jaundice. Nocturnal exacerbation of thirst, pains in chest, etc. Legs freely movable. Fourth day after operation crural pains returned and pulsation in lower part of tumor. On the sixth day following operation, pus escaped along the ligature. On the ninth and tenth days hæmorrhages from the wound, which had partly healed. Legs now became cold and could not be warmed. Abdomen bloated greatly, frequent vomiting, much pain. Death on the eleventh day. Patient had survived eleven days and twenty hours after operation.

Autopsy.—Peritoneum unchanged. Aorta had been tied four lines above bifurcation. A perforation had occurred opposite the knot of the ligature. No central and only incomplete thrombus formation.

South. (*Lancet*, 1856, Vol. ii, pages 47 and 222.)—Patient, a man aged twenty-one years.

Indication.—Diffuse aneurism of left common iliac and left external iliac.

Date of operation, June 21, 1856, at 2 P.M. Superficial incision in left

of flank, beginning just above the anterior superior spine of the ilium and extending to the tenth costal cartilage. Peritoneum opened laterally. Retraction of wound and ligation performed.

Patient did remarkably well after the operation, but died forty-three hours after the intervention. (Details fail.)

An autopsy was performed, but there were no pathological findings aside from the aneurism.

Hunter McGuire. (*American Journal of the Medical Sciences*, 1868, No. cxii, p. 415.)—Patient, a man aged thirty years.

Indication.—Aneurism of left external iliac artery, both common iliacs, and the lower extremity of the abdominal aorta, with threatened rupture.

Date of operation, March 30, 1868, at 1 P.M.

Operation.—Left-sided laparotomy, incision from last costal cartilage to spine of ilium. Exposure of peritoneum. Index-finger between latter and fascia. The first incision was but one inch long, and was completed with the inserted finger as a guide. Intestines pushed aside and the aneurism exposed at its upper portion. Under manipulation, it ruptured with escape of a pint of blood, which was carefully removed, the aorta having been ligated.

Immediate Results.—Patient had a transient collapse, from which he recovered. The first evening, pulse weak, legs numb, and there was frequent vomiting. The body temperature (axilla) was 96° F.; temperature in knee-hollow, 89°; of feet, 82°. Urine drawn. Patient drowsy and slept. During the evening, some reaction, skin and extremities becoming warm. After two hours' sleep patient waked up very anxious and complained much of pain. Had full doses of whiskey and opium. He again fell asleep, and waked after another hour very restless and with great pain in legs. These symptoms progressively increased until the death of patient at 12.30, preceded by paralysis of the sphincters. Patient lived eleven and one-half hours after the intervention.

Autopsy.—Intestinal viscera healthy. Ligation had been placed at the level of the inferior mesentery, and the left ureter, which had been embedded in the sac, had been enclosed with it. The sac had ruptured just above bifurcation.

William Stokes. (*Dublin Quarterly Journal*, 1869, Vol. xlviii, p. 1.)—Patient, a man aged fifty years.

Indication.—Diffuse iliofemoral aneurism involving the right common iliac, internal iliac, and upper part of femoral.

Operation performed March 8, 1869, in the forenoon.

Operation.—Semilunar incision five and one-half inches long in left side from one inch below the tenth rib to two finger-breadths above the junction of the middle and internal third of Poupart's ligament. Soft parts incised down to peritoneum on a grooved director; parietal peritoneum slightly wounded, with insignificant protrusion of peritoneum. Peritoneum separated from subjacent tissues with the hand. Sac and aorta exposed with difficulty. A silk ligature was applied, the ends of which were attached to a Porter artery-compressor, the object being to apply a "temporary ligature." No blood lost worth mentioning.

Immediate Results.—Considerable shock from the intervention, suc-

cessfully combated by brandy. Legs became cold, the right more so than the left. No paralysis of any sort. Left leg kept drawn up. Two hours after operation great restlessness. Patient screamed with pain at intervals, referred to ball of the great toe, sole of the right foot, and hollow of right knee. No cause could be found for these pains. About 3 P.M. patient became better, ate and slept. Temperature of left limb "very good," of right limb somewhat increased. Between 5 and 6 P.M. syncopal attacks controlled by stimulants. At 9 P.M. femoral pulse perceptible. At 10 P.M. collapse, stupor. Death at twelve o'clock, midnight. Patient had survived thirteen hours.

Autopsy.—The aneurism had begun to wear away the pelvic bones. The compressor had grasped the aorta alone. Water could not be forced through from above. Intima not altered. Patient had a fatty heart (degeneration); other viscera, etc., normal.

P. H. Watson. (*British Medical Journal*, 1869, Vol. ii, 216, and personal letter to Liebrecht in *Journal d'Accouchements*, etc., November 30, 1885.)—Nothing as to *personnel* of patient.

Indication.—Nine weeks before the external iliac had been ligated (not stated what for). The wound had healed, but secondary hemorrhage of an insidious character set in, and it became necessary to tie higher up.

Date of operation not stated. A massive clot had formed in the iliac fossa, so that the iliac artery could not be isolated. The abdomen then opened at the umbilicus, intestines and mesentery pushed aside, aorta exposed in front and tied below inferior mesentery.

Results.—In the letter to Liebrecht it is stated that the patient lived a week; in the published report, but sixty-five hours. Patient did well for first forty-eight hours; gangrene developed in both legs, worse on affected side.

Czerny. (*Wiener Medicinische Wochenschrift*, 1870, pp. 1, 402.)—Patient, a soldier aged twenty-seven years.

Indication.—Wound received involving iliac artery.

Operation.—Czerny tied the aorta above the bifurcation.

Result.—The patient died twenty-seven hours after the operation of acute sepsis and hemorrhage.

Czerny. (*Centralblatt für Chirurgie*, 1879, Vol. vi, p. 737.)—Patient, a man aged fifty years.

Indications.—In removing a tumor of the kidney, it was found impossible to ligate the renal artery successfully, so Czerny ligated the aorta at a point midway between the two renal arteries.

Result.—The patient died ten hours after the operation, but the cause of death is not clearly stated.

H. Milton. (Of Kasr. el Aini Hospital, Cairo, London *Lancet*, 1891, Vol. i, p. 85.)—Patient, a man aged forty-five years.

Indication.—He had been admitted to the hospital for an aneurism of the aorta. It had been intended to cut down and apply an apparatus for compressing the vessel against the spine; but before anything could be done, the aneurism underwent spontaneous rupture, as shown by the effacement of the circumscribed tumor and evidences of acute internal hemorrhage.

Date of operation, July 3, 1890. Laparotomy was performed immediately after rupture. (The original tumor, as large as an orange, had been slightly to the left of the median line; pulsating and painful. Patient syphilitic and arteriosclerotic, but in good health and with no history of trauma.)

Incision five inches long in linea alba; omentum and intestines pushed aside. Peritoneum over aneurism incised enough to admit fingers. The vessel was then compressed and isolated one inch above the aneurism, where the vessel was healthy. Needle readily passed about aorta eight lines above aneurism. Ligature of thick silk. Peritoneum sponged dry. Wound closed without drainage. The escaped flow from rupture all lay behind peritoneum, where it was left untouched. Duration twelve minutes; all pulsation ceased.

Immediate Results.—First rally one hour after operation. Patient complained of intense pain and tingling in both legs. Passed thirteen ounces of urine, free from albumen or blood. Death occurred suddenly day after operation, of anæmia and shock. Patient survived operation twenty-four hours.

Autopsy.—Aneurism limited to aorta. Upper limit, one and one-half inches below renal arteries; lower limit, three-fourths inch above bifurcation. Rupture at left margin of lower surface. Four pounds of blood had escaped. No other pathological changes.

Tillaux. (*Lancet*, 1891, Vol. i, p. 85.)—Patient, a man aged fifty-six years.

Indications.—Aneurism of the left iliac artery of a year's duration. Part of the wall of the artery ruptured. Aneurism became diffuse, reaching to the wall of the umbilicus.

Operation.—Artery was ligated with silk above the bifurcation. There was no pain or circulatory disturbance after the operation; but it was found on post-mortem examination that the lumen of the artery had not been entirely occluded.

The patient lived twenty-nine days, and the cause of death is not clearly stated; but Tillaux notes the suffering from excessive venous congestion.

Keen. (*American Journal of the Medical Sciences*, September, 1900.) Patient, a man aged fifty-two years.

Indications.—Admitted to Jefferson Medical College Hospital November 8, 1899, with epigastric tumor caused by an aortic aneurism, together with a large hæmatoma from rupture of the aneurism.

Operation.—Operation for ligation of the aorta was done on December 12, 1899. A midline incision was made from the ensiform cartilage to the umbilicus, and a ligature of floss silk was applied close to the diaphragm. Immediately after operation the patient's legs were cold, but sensation was little disturbed and motion not much impaired. Eight days later there was some pulsation of the femoral arteries and the legs were warm. There was still some aneurismal bruit and distention.

The patient was apparently making a recovery from the operation, but died on the forty-eighth day from hæmorrhage at the site of the ligature.

THE SYMPTOMATOLOGY, DIAGNOSIS, AND
TREATMENT OF CARCINOMA OF
THE CÆCUM, WITH A RE-
PORT OF TWO CASES.

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(Concluded from page 74.)

WE will here give a brief *résumé* of the cases of carcinoma of the cæcum which have been published up to the present time, arranged in groups according to the nature of the surgical interference to which they were subjected.

I.—CIRCULAR ENTERORRHAPHY WITH END-TO-END SUTURE.

CASE I.—(Kraussold.) Male, aged sixty-two years. Attributes his symptoms to a kick received in the right iliac fossa six years ago. For the last thirteen months has had two fæcal fistulæ. A tumor the size of a fist can be felt in the right iliac fossa.

Abdominal incision as used for ligature of the internal iliac. Section of the intestine above and below the tumor, which was then freed and removed with difficulty on account of adhesions with the large vessels. End-to-end anastomosis, with Lembert's suture. The ileum was greatly dilated. Curettement of the fistulæ. Suture of the abdominal wall. Death two hours after operation. Postmortem: enlarged glands in the mesentery, and a small nucleus of carcinoma in the right lobe of the liver.

CASE II.—(Sidney Jones.) Female, aged fifty-four years. Six months ago complained of pain on the right-hand side of the abdomen, and for the last four months has felt a tumor in the right iliac region. Loss of flesh and appetite, constipation. A hard, irregular tumor, movable laterally and painful, can be felt.

Operation performed by making a longitudinal incision over the tumor. The neoplasm includes a portion of the ascending colon and the transverse colon. Circular enterorrhaphy; the first layer of sutures included the entire wall of the gut; second layer in the peritoneum. Fixation of the intestine to the abdominal wall. Suture of the abdominal wall leaving an opening at the lower angle of the wound, which was plugged with gauze. Death three days after the operation. Postmortem: Insufficiency of the sutures, with pus in the mesentery around resected gut.

CASE III.—(Billroth.) Female, forty-three years old. Oblique incision in the right inguinal region. A hard, irregular tumor adhering to the iliac fascia was removed. End-to-end anastomosis. Drainage. Discharged well five weeks later.

CASE IV.—(Billroth.) Male, aged forty years. Diagnosis, tumor of the kidney. At the operation, carcinoma of the cæcum found. End-to-end anastomosis. Collapsus and death in twenty-four hours.

CASE V.—(Billroth.) Male, aged thirty-eight years. Tumor the size of the fist in right iliac region, freely movable. Incision for ligature of the external iliac. Resection of neoplasm, end-to-end anastomosis. Death from septic peritonitis in twenty-four hours.

CASE VI.—(Billroth.) A very thin man. Tumor in the right iliac fossa, extending to the median line of the abdomen. Some ascites. Diarrhœa and colicky pains for twelve years.

Incision carried along the axillary line, and curving towards the ligament of Fallopius. Resection of cæcum, and end-to-end anastomosis. The neoplastic mass in the iliac fossa extended down to the vertebral column, and no attempt was made to remove it. Suture of the abdominal wall and drainage.

Much vomiting following the operation. Next day intestine was opened and a drainage tube introduced. Death nine days later. Postmortem: Perforation of the posterior wall of the cæcum and in the small intestine two centimetres from the point where it joins the cæcum. The sutures held. Carcinomatous glands in the mesentery; the parietal peritoneum of the pelvis infiltrated with carcinoma.

CASE VII.—(Czerny.) Male, aged forty-seven years. Commencement of the disease dates back four years. Pains in the region of the epigastrium, with nausea and vomiting. Lately has had diarrhœa alternating with constipation. Loss of flesh. Tumor felt in the right half of the abdomen, having a transversal direction and following the movements of the diaphragm.

Incision along the outer border of the right rectus. The case was one of colloid carcinoma of the cæcum and ascending colon. Growth adhered to duodenum, right kidney, and under aspect of the liver. End-to-end anastomosis of ileum, with transverse colon. Death a few hours afterwards. Postmortem: The sutures had held; operation had lasted four hours and a half.

CASE VIII.—(Matlakowsky.) Male, aged sixty-seven years. Tumor in the right iliac region, which the patient had noticed about three years

previously, and which had increased in size and become painful. When first noticed, it was movable, but now is immovable and adherent to the abdominal wall.

Incision along the external border of the rectus. The skin œdematous; abscess of the greater oblique muscle communicating with the cæcum. To get more space, two transverse incisions were added to the one already made, one extending towards the umbilicus and the other towards the anterior superior iliac crest. After this the peritoneal cavity was opened and extirpation of a part of the colon and ileum along with some enlarged posterior glands was done. End-to-end anastomosis with circular suture was performed without difficulty because the calibre of the ileum was increased and the walls of the colon were thickened. Suture of the mesenteries above the origin of the mesocæcum. Abdominal wall sutured with difficulty, and part of the wound was plugged with iodoform gauze. Operation lasted three hours.

Four days after the operation the external part of the incision broke open. The patient left the hospital in two months, and when examined two months after this his general condition was excellent.

Histological examination showed that the growth was carcinoma of the cæcum and of the adjacent portion of the intestine, whose calibre was greatly decreased. The valve had disappeared.

CASE IX.—(Péan.) Female, forty-eight years old. Symptoms began six months ago, with pains in the right iliac fossa, which had been increasing during the last three months. Increase of pain when right leg was moved. The growth was movable, hard, and painful when pressed on.

The report of this case does not give any detail of the operation. Thirteen days afterwards the patient died, and after death some black blood escaped per anum.

Postmortem: The sutures had held well. The terminal portion of the small intestine, as well as the large intestine, was filled with clots of black blood. Microscopical examination of the growth showed it to be a lobulated epithelioma.

CASE X.—(Bramann.) Female, forty-three years of age. Carcinoma of the cæcum, resection of fifteen centimetres of the ileum, of the ileo-cæcal valve, of the cæcum, of the ascending colon and the right half of the transverse colon with the corresponding mesentery that was infiltrated. Circular enterorrhaphy. Cure. The patient was seen a year later and no recurrence had taken place.

CASE XI.—(Sendler.) A female without any personal or hereditary antecedents was taken suddenly with pains in the right iliac fossa without fever or vomiting. Two months later a similar attack occurred. A smooth tumor was found in the right iliac fossa; by palpation it was found to be hard and apparently attached to the cæcum.

Laparotomy.—When the abdomen was opened, the cæcum was found adherent to the abdominal wall, and comprised in a smooth, hard growth which had invaded the ascending colon and mesocolon. Resection of the cæcum with the colon and the mesocolon; end-to-end anastomosis of the

ileum to the colon. Cure without complication. Microscopical examination; carcinoma.

CASE XII.—(Veliaminow.) Female, thirty-six years old; presented symptoms of an intestinal neoplasm for ten years. Resection of the ileum and cæcum, removing about twenty-two centimetres of intestine. Circular suture. Antiseptic tamponing of the abdominal cavity. One week after the operation the intestinal sutures gave way, and the patient died septic the next day without signs of peritonitis.

CASE XIII.—(Vautrin.) Extirpation of a carcinomatous tumor of the cæcum which required the resection of twenty-two centimetres of the large intestine. Circular suture, but allowing an opening to be left on the anterior aspect of the intestine, which was sutured to the parietal peritoneum in order to establish a fistula so as to prevent tension on the suture by gas and fæces. Cure.

CASE XIV.—(T. Anger.) Female, forty-six years old. Commencement of the symptoms dated back two years. Digestive disturbances; alimentary and bilious vomit, accompanied with fever. Three months before operation the pains became localized in the right iliac fossa and a tumor could be made out. The patient had lost flesh; yellow tint to skin. The tumor was adherent to the abdominal wall, but not to the deeper structures.

Incision of the abdomen as in ligature of the external iliac. The malignant mass was adherent to the muscles of the abdominal wall, which were infiltrated. Resection of the ileum and ascending colon. The ileum was somewhat dilated. End-to-end Lembert's suture. Drainage with a wick of iodoform gauze. The patient left the hospital six weeks later with an intestinal fistula.

The specimen represented nine centimetres of the large intestine and six centimetres of the small. The ileocæcal valve was destroyed. Microscopical examination, epithelioma.

CASE XV.—(Caird.) Male, aged forty-three years; complained of a swelling in the right side; for the last fourteen weeks he had been weakened by repeated vomiting. Pleurisy three months ago. A few weeks before the operation he had been taken with chills and fever, and a tumefaction the size of a cocoanut appeared on the right side of the umbilicus; the tumefaction was soft, indistinctly limited, and fixed in position. Urine normal. This tumefaction was in the first place taken for an inflammation. It diminished in the first place by treatment, then became limited and remained stationary. The abdomen was opened on the right-hand side and a large tumor of the ileocæcal valve and colon was discovered. It was detached with difficulty on account of a vascular adhesion which united the growth to the peritoneum and to coils of small intestine. It was finally freed by clamping and cutting the free loops of gut with which it was connected, and then its complicated relationships could be made out. The intestine had been transversely cut in two places. Suture of the ileum at the hepatic flexure of the colon. The remaining parts of the gut were included in vascular adhesions. On account of the weak condition of the patient, the opened ends of the gut were brought

into the abdominal incision and a Paul's tube was placed in each end and the abdomen closed. The patient survived the operation three days.

CASE XVI.—(Beltinger.) Female; complained of pain in the right side of the abdomen in June, 1894; the pain radiated towards the sacrum. The following February the patient remarked a tumor in the right side of the abdomen below the umbilicus. Loss of flesh. The tumor was the size of a goose-egg, hard, lobulated, and movable. The entire colon up to the cæcum became rapidly distended with air when it was blown up the rectum, but the dilatation of the intestine ceased above the ileo-cæcal valve. Inguinal glands enlarged. Loss of appetite; regular movements, but which were never tinted black.

Diagnosis.—Carcinoma of the cæcum.

On the 9th of April, 1895, an incision ten centimetres long, parallel with Poupart's ligament, commencing at the anterior superior iliac spine, was made. After the abdominal wall was incised, a movable lobulated tumor was discovered, perfectly free from adhesions, buried in both the ascending colon and the small intestine. In the midst of the tumor the remains of a normal appendix with the small mesentery was found. As the tumor was movable, it was easily drawn out of the incision. The mesentery was removed a small distance from the tumor and the diseased lymphatics were excised. The colon and small intestine were cut about a finger's-breadth above the tumor, which was then removed. Anatomical diagnosis was carcinoma of the cæcum.

CASE XVII.—(Eiselsberg.) Carcinoma of the cæcum and ascending colon. Resection of the lower part of the ileum and of the diseased large intestine. Improvement. Death eleven months afterwards from the generalization of the disease.

CASE XVIII.—(Keetley.) Female, thirteen years old. Anæmic, delicate, suffering from pain in the right side of the abdomen produced by a tumor. Symptoms of partial obstruction with intermittent vomiting. One bloody stool. Upon examination, February 19, 1894, two tumors could be made out in the right-hand side of the abdomen. They were rather round, one being situated on the right-hand side just above the umbilicus, the other between the umbilicus and Poupart's ligament. It was thought that some fluctuation could be made out. The patient had suffered for about a year, complaining of a sensation of weight, which had disappeared on several occasions. The pain was more manifest when the patient walked and at about an hour after meals. Daily evacuation of the bowels. Systolic mitral souffle and presystolic thrill. Double aortic souffle.

Operation, February 23, 1894. The upper tumor was movable, and a long incision was carried over it and below the tumor. As soon as the peritoneum was opened, the omentum and tumor appeared in the wound. The growth started in the ascending colon, which was incised longitudinally. The tumor was composed of a hard, irregular, fleshy mass. Its surface had a mucous aspect. The tumor was seized and removed, cutting the hypertrophied intestinal walls to which it was attached at its base, and it was then found that the small intestine penetrated the growth.

The small intestine was cut between two clamps, and extirpation of the growth was accomplished, consequently leaving two openings in the ascending colon. The last one was made when the base of the growth was cut away, and its calibre was larger than that of the ileum. The latter was only united at its lower part by an interrupted suture, and the remainder was closed by a continuous suture. The first incision in the colon was closed by a continuous suture of the mucous membrane and the muscular layer and peritoneum were united by a Lembert suture. A Lembert suture was also placed on the peritoneal serous membrane, uniting the small and large intestine. The retroperitoneal tumor, which was the size of a large orange and appeared to be lymphatic glands, was allowed to remain, with the intention of removing it later. Drainage. In spite of the weak and anæmic condition of the patient, she recovered from the operation.

After the operation she vomited several times. On the fourth day there was a cloudy, yellow discharge from the drain in the abdomen. Improvement in the general condition. Unfortunately, the tumor, composed of lymphatic glands, gradually increased in size, and extended a little to the left of the median line and above the umbilicus. It was removed five weeks after the first operation without any difficulty. Six days after the second operation, fæces came through the wound, and on the next day the entire wound, including that of the first operation, broke open. The patient continued to feel better, and appeared to be so, but a stercoral fistula of the colon remained. A recurrence in the lymphatics took place and attained an enormous size, distending the abdomen and pushing out the anterior abdominal wall. The patient's strength gradually failed, vomiting took place, and she died.

Keetley thinks that the fistula came from a necrosis arising from obstruction to the afferent and efferent vessels of the intestine, which was done when the retroperitoneal neoplasm was removed. The diagnosis in this case was sarcoma of the ileocaecal valve with retroperitoneal lymphatic metastasis.

CASE XIX.—(Gillford.) Female, twenty-seven years of age; for fourteen years had complained of sharp pains in the right lower limb. In August, 1892, she complained of pain in the right lumbar region, and when examined on January 30, 1893, the right kidney appeared to be increased in size and lower down than normal. A diagnosis of sarcoma of the kidney was made.

A lumbar incision was made and the kidney found healthy. The incision was carried to the crest of the ileum, so that it made a T. The neoplasm was separated from the kidney and iliac fascia, and a piece of the psoas muscle was removed in extirpating the growth. The lumen of the ascending colon was partly closed, and a continuous anastomosis was made between the colon and the ileum.

One week after the operation the wound became infected and partially opened. Six months after the operation the patient appeared well, and there was no sign of recurrence. The tumor was diagnosed sarcoma, but no microscopical examination was apparently made.

CASE XX.—(Czerny.) Male, forty-five years old. Three years ago began to feel pain in the ileocæcal region, and for the last five months there has been obstinate constipation followed by melæna for a fortnight. A cylindrical growth can be felt in the region of the ascending and transverse colon.

An incision was made along the external border of the rectus. The cæcum was found invaginated in the ascending colon. Extirpation of part of the ileocæcal angle in removing a cauliflower growth growing from the walls of the cæcum and the ascending colon. Two layers of sutures. Death the next day.

Autopsy.—Generalized peritonitis, sutures did not hold.

CASE XXI.—(Billroth.) Male, thirty-two years old; for three months has complained of colic in the region of the umbilicus. When the pain is present, a hard, distinctly limited tumor can be felt in the region of the umbilicus.

The abdomen was incised in the median line, and a tumor formed by an invagination in the transverse colon was found. Resection of the ileum, cæcum, and five centimetres of the colon. Wölfler's circular suture. Death.

Autopsy.—Diffuse purulent peritonitis. Gas escapes through the suture, and there is a space in the incision of the mesentery. In the cæcum is found a carcinomatous growth the size of a pigeon's egg.

CASE XXII.—(Lauenstein.) Male, fifty-five years old. The trouble began by an intestinal obstruction three months previously. Tumor in the right iliac fossa. Laparotomy. Extirpation of the cæcum, circular suture. Patient well at the end of three weeks.

Diagnosis.—Small carcinoma of the cæcum, which had become invaginated.

II.—END-TO-END SUTURE WITH OBLIQUE SECTION OF THE ILEUM AND NARROWING OF THE LUMEN OF THE COLON.

CASE XXIII.—(Billroth.) Male, aged fifty-six years. Rapid increase in size of a tumor, the size of a goose-egg, situated in the right hypogastric region. No digestive disturbances.

The incision was carried from the umbilicus to the middle of Poupart's ligament. Neoplasm of the cæcum; transversal section of the ileum and of the colon. No drainage. On the sixth day following the operation an artificial anus was made. Death on the next day, which was attributed to a bend in the intestine.

CASE XXIV.—(Billroth.) Extirpation of cæcum for a cylindrical cell epithelioma of the cæcum. Circular enterorrhaphy after closing off part of the lumen of the colon by removing a triangular flap from the free border of the colon.

CASE XXV.—(Billroth.) Male, forty-seven years old. Three years ago received a traumatism in the right inguinal region. Eighteen months ago he noticed for the first time a tumor in the ileocæcal region. Loss of flesh. Distention and constipation.

An oblique incision was carried across the long axis of the tumor, the

extirpation of which required the removal of part of the iliac fascia. Enterorrhaphy. One of the clamps placed on the gut slipped and scraped it. The patient died a fortnight from purulent peritonitis. The sutures held.

Diagnosis.—Carcinoma of the cæcum.

CASE XXVI.—(Von Bergmann.) Male, thirty-five years old. Father died of carcinoma of the stomach. Symptoms of present disease began a year ago. Movable tumor found. Abdomen opened by incision along outer border of rectus. Resection. The patient seen six months after the operation in excellent health.

CASE XXVII.—(Hofmøkl.) Female, twenty-six years old; complains of pain in the right iliac fossa for a year. Vomiting and diarrhœa.

Abdomen opened by an incision on the outer border of the rectus. Extirpation of the cæcum. Triangular resection of the wall of the large intestine and oblique section of the ileum. Recovery.

Anatomical Diagnosis.—Adenocarcinoma of cæcum.

CASE XXVIII.—(Czerny.) Male, fifty years old. Twenty years previously had inflammation of the cæcum. Tumor can be felt in right iliac fossa, accompanied by vomiting and diarrhœa.

Incision on external border of right rectus. Tissues infiltrated. Ureter not cut, but spermatic artery had to be ligated. Patient suddenly collapsed, and died three days after the operation.

Autopsy.—Septic peritonitis. The infection probably originated from the contact of the diseased gut with the peritoneum during operation.

CASE XXIX.—(Czerny.) Male, aged forty-eight years. In October, 1889, diarrhœa and pain in the right half of the abdomen. In January, 1890, a small tumefaction could be found above the groin. Constipation accompanied with the taste of fæces in the mouth. Tumor of the cæcum.

Incision of the abdomen parallel to the arcade of Fallopius. Extirpation of the growth. Suture of the ascending colon to the ileum after the lumen of the colon had been decreased. Death eight days after.

Anatomical Diagnosis.—Glandular carcinoma of the cæcum.

CASE XXX.—(Billroth.) Male, fifty-four years old. Disease began five months ago with abdominal pains, which for the last three or four weeks have become localized in the region of the cæcum. A hard, irregular tumor can be felt in the region of the cæcum, which is movable transversely, but not vertically. Lateral incision. The tumor appeared to be carcinoma of the cæcum, and, in order to remove it, the underlying peritoneum had to be cut away with the growth. Transversal section of the colon and oblique section of the ileum.

The wound broke open, secondary suture. When the patient left the hospital, he had a fistula. A few months later he died cachectic.

Autopsy.—Carcinoma of the intestine, with secondary deposits in the diaphragmatic peritoneum with right-sided hæmorrhagic pleurisy. According to Salzer, tubercular ulceration was the cause of the development of the carcinoma, or it might have been that the carcinomatous ulcera-

tion opened the door for tubercular infection, because in this case the carcinoma of the cæcum was complicated with tuberculosis of the organ.

CASE XXXI.—(Frank.) Male, thirty-six years old. When fourteen he had diarrhœa, and for the last year has complained of colic and distention of the abdomen. During the colics, peristaltic movements of the intestine can be seen. Loss of appetite and flesh; constipation.

Diagnosis.—Tuberculosis of the cæcum.

Oblique incision. Tumor was movable, and a large tumor was found in the mesocæcum. Extirpation of the cæcum with a mass of lymphatic glands. Resection of twenty centimetres of the colon and fifteen centimetres of the ileum. The calibre of both the large and small intestine was increased. Transversal suture of the colon and end-to-end anastomosis with the small intestine. Recovery.

Anatomical Diagnosis.—Neoplasm the size of a fist, composed of an ulcerated glandular carcinoma; great dilatation of the small and large intestine. The patient was seen six months after the operation in excellent health.

CASE XXXII.—(Frank.) Patient, forty-eight years old. Male. Typhoid fever at the age of twenty-four. Has noticed a tumor for the last month; the growth follows the movements of respiration, is movable, and of hard consistency. Exaggerated peristaltic movements during the colics from which the patient suffers.

Oblique incision of the abdominal wall, revealing a tumor the size of a fist. Extirpation. In order to accomplish an anastomosis, the lumen of the ascending colon was decreased by a transversal suture. The patient left in good health four weeks later.

Anatomical Diagnosis.—Glandular carcinoma.

CASE XXXIII.—(Caird.) Female, forty-seven years old; complained of feeling a weight in the right iliac fossa; no constipation. Loss of strength. In July, 1891, had intermittent pains in the left side. A year later, after violent exercise, another attack of pain, which lasted longer. In January, 1893, a tumor was discovered in the right iliac fossa, which became painful, the pain sometimes shooting to the left side. Later there was nausea and a distaste for food, but no vomiting. Alternating constipation and diarrhœa. Urine normal. Between the umbilicus and the anterior superior iliac crest a hard tumor could be felt the size of the fist, rounded in shape, and slightly movable laterally.

In March, 1893, the abdomen was opened along the axis of the tumor. At the point of the incision, the colon, which was adherent, was mistaken for the peritoneum, and was opened. Digital exploration discovered a growth at the ileocæcal valve within the gut, which had contracted adhesions with the surrounding organs. The opening into the gut was closed by a clamp, and then the appendix, the cæcum, and the portion of the colon and ileum were resected. Transversal section through the colon, after which its lumen was partially closed in order to do an end-to-end anastomosis with the ileum. After the operation, a small fæcal fistula took place, but which was cured, and the patient has remained in good health up to the time of the report, which was in 1895.

III.—ENTERORRHAPHY BY INVAGINATION.

CASE XXXIV.—(Bassini.) Male, twenty-two years old. Father died of cancer of the rectum. At the age of nineteen had a left-sided pleurisy. In 1896, intermittent pains in the right side of the abdomen with some tympanism. The same symptoms occurred again in January, 1887, and a tumor the size of a fist was made out in the right iliac fossa.

Exploratory laparotomy, January 1, 1887. Vertical incision of the abdomen. Extirpation of the cæcum. As the growth was found to be a lymphosarcoma of the ileocæcal valve, the ileum was invaginated about three centimetres into the colon and held in place by a Lembert suture. The patient was discharged well twenty-nine days later.

CASE XXXV.—(Paul.) Male, aged forty-seven years. In a state of advanced anæmia. Commenced to lose strength twelve months ago, and has suffered from abdominal symptoms for the last eight months, such as diarrhœa, vomiting, and intermittent abdominal pain. Patient very pale and thin. A tumor the size of a large orange was found in the right iliac fossa and appeared to surround the ileocæcal valve.

The abdomen was opened, the tumor was freed, and extirpation of the cæcum with part of the ileum was performed. Anastomosis with bone plates was attempted, but given up. The end of the ileum was invaginated in the colon for about five centimetres, and several rows of Lembert sutures were necessary to retain it. Drainage. Death forty-two hours after the operation from ulceration of the anterior aspect of the colon, due probably to the cutting off of its blood supply. The neoplasm was carcinoma.

IV.—ANASTOMOSIS BY LATERAL IMPLANTATION.

CASE XXXVI.—(Körte.) Male, aged forty-five years; suffered for about a year with abdominal pains, loss of flesh, and inability to work. A tumor at the lower part of the colon had been felt and diagnosed as an invagination, but the next day it had disappeared. A few days later a tumor could again be felt; it was hard, movable, and lobulated, and appeared to be hidden under the right lobe of the liver; but when dislodged from this point, it would be moved in all directions; and, although it much resembled a movable kidney, it was still thought that the tumor was an intestinal invagination.

The abdomen was opened, and it was then found that the mass was a growth in the cæcum, also including the ascending colon and extremely movable. Extirpation of the cæcum and anastomosis by lateral implantation. The patient rapidly recovered from the operation and gained forty pounds in weight.

Anatomical Diagnosis.—Adenocarcinoma of the cæcum, with invagination of about seven to eight centimetres, and held in place by adhesions. A few enlarged lymphatic glands in the mesocolon.

CASE XXXVII.—(Helferich.) Resection of the cæcum and ascending colon for carcinoma. The transverse colon was closed and lateral implantation of the ileum done. Eight days after the operation, symp-

toms of intestinal occlusion occurred, and proved on laparotomy to be an internal strangulation with torsion of the gut on its axis.

CASE XXXVIII.—(Rafin.) Female; complained of pain for the last three months in the abdomen. For the last few weeks the pains occurred a dozen times a day, especially after eating, and were noticed particularly above the umbilicus, especially on the right. Tumor could be felt on the right-hand side of the abdomen. It was about the size of a fist, quite round, of firm consistency, and a slightly uneven surface. It was movable, and, although found on the right-hand side of the abdomen, it could be pushed towards the lumbar region and towards the left. It could be brought up in contact with the liver, and could be pushed without difficulty into the iliac region near the uterus, at which point it was very easily distinguished by sight and by palpation; by bimanual examination it could be felt in the vagina, and through the abdominal wall as a hard, rounded mass projecting into the posterior and lateral culs-de-sac, giving the exact impression of a fibroid tumor. Pressure on the tumor produced severe pain. No vomiting, bowels regular. Patient pale, but not yellow; has lost four pounds in a short time.

Median incision was made, and the hand, introduced into the abdomen at first, could not find the tumor; but after exploring, it was found behind the uterus and was easily brought out of the abdominal incision. It was then found to be carcinoma of the cæcum, which also included the terminal portion of the ileum. A small gland was found in the mesocolon. The small intestine was sectioned about ten centimetres from the cæcum, and the colon was cut at some little distance from the neoplasm. An angular excision of the mesocæcum, so as to include the large lymphatic gland, was done, and then the tumor was removed. Ileocolorrhaphy by lateral implantation according to Billroth's technique. A small Mickulicz drainage.

Anatomical Diagnosis.—Carcinoma of the cæcum.

CASE XXXIX.—(Julliard.) Male, aged fifty-six years; always in good health until September 25, 1896, at which time he complained of pains in the right iliac fossa radiating down the right leg and in the lumbar region. Ten days later he entered the hospital. By palpation, a distinctly limited tumor, oval in shape, and about the size of a goose egg, could be felt in the right iliac fossa. Its long axis was directed longitudinally, its surface was irregular, and its consistency hard. The lower part of the growth was painful to pressure. The abdominal walls were movable over the tumor, but the neoplasm adhered to the deep structures. The patient had suffered from alternating constipation and diarrhoea, but had never passed blood per rectum.

The abdomen was opened, and it was found that the omentum was greatly thickened and indurated, and adhered to a great extent to the parietal peritoneum, as well as to the neoplasm which it covered. It was freed from its adhesions and resected, thus revealing the neoplasm, which was found to involve the cæcum. The large intestine was sectioned six centimetres below the growth and the ileum five centimetres above it, and the cæcum, with its appendix and portion of the ileum and colon,

was removed. The small intestine was united perpendicularly to the colon three centimetres from the end of the latter. Recovery. Seven months after the operation the patient was well.

Anatomical Diagnosis.—Carcinoma of the cæcum.

V.—ENTERO-ANASTOMOSIS WITH FOREIGN BODIES.

CASE XL.—(Senn.) Male, thirty-seven years old. Two years ago had vomiting, which became fæcal in nature, and then stopped spontaneously. Two months after this had another attack, accompanied with pains in the ileocæcal region, and shortly afterwards he discovered a tumor. These attacks occurred at lesser intervals, and finally became permanent. For the last six months there has been a constant diarrhœa.

After the abdomen was opened, a tumor was found which included the entire cæcum. It was enucleated as well as the diseased peritoneum. In the mesentery of the ileum were enlarged lymphatic glands, so that eighteen inches of the gut were resected. Anastomosis of the intestine with Senn's bone plates, and a few Lembert sutures were inserted to make the union more solid. The gut was stitched near the wound with silk. On the ninth day a portion of the button came away, and the other half, coming from the ileum, was voided on the tenth day. The patient was discharged well thirty-one days after the operation.

Anatomical Diagnosis.—Cylindrical-cell carcinoma of the cæcum.

CASE XLI.—(Senn.) Female, fifty-three years old. A year ago had an attack of vomiting, which again occurred a month ago. For the last six weeks there had been a tumor in the region of the umbilicus.

Median incision. The tumor was composed of the cæcum, which had become invaginated in the transverse colon, and there was an ulcerated carcinoma of the cæcum. Ileocolostomy with bone plates. The point of anastomosis was sutured in the iliac fossa. Septic peritonitis on the third day.

Autopsy.—The closed end of the colon had become torn above. Serous surfaces between the bone plates were adherent.

CASE XLII.—(Lawson Tait.) Male, aged forty years; received a kick in the abdomen seven years ago. In 1890 he had influenza. In May, 1892, he had a severe intestinal hæmorrhage, which recurred in June of the same year. In November he noticed for the first time a swelling above the crural arcade. A large tumor, the size of an adult fist, was found in the region of the umbilicus.

The abdomen was opened by an incision along the external border of the right rectus. The adherent omentum was peeled off, the tumor separated from the ascending colon, and then the pedicle and ileum were cut. The colon was then sectioned at a right angle. The mesentery contained tubercular granulation. Anastomosis by lateral apposition with Senn's bone plates. The patient left well on the twenty-fifth day, and at no time during his convalescence had any of the bone plates been found in the fæces.

CASE XLIII.—(Mayo Robson.) Patient, aged forty years, very weak

and anæmic. A tumor in the right iliac fossa, which, according to the patient, had been there for a year.

Median incision. Many adhesions. The omentum had to be ligated several times before it could be detached from the cæcum. Anastomosis with Murphy's button after resection of the cæcum. When the nurse was away, the patient got out of bed on the next day and the dressings became displaced, which was probably the cause of the suppuration which came on later. A week after the operation a small quantity of feces came through the wound, and this lasted for a week, when the wound closed by granulation and the permeability of the intestine was complete. The patient had abdominal pain and vomiting due to button. These symptoms only ceased after the forty-fourth day, when the button was discharged.

The amount of intestine removed measured six inches, and the growth was a carcinoma of the cæcum and ascending colon.

CASE XLIV.—(Lawford Knaggs.) Female, aged thirty-three years. At the age of six she had a tubercular hip-joint. The last eighteen months the patient has complained of pain in the abdomen, intestinal disturbances, with loss of flesh and a rapidly growing tumor in the right iliac region. Vomiting and diarrhœa. By examination, a large movable tumor, which followed the respiratory movements, could be detected. It was painless, and apparently had no connection with the pelvic viscera.

After the abdomen was opened, a tumor the size of a melon was removed along with the greater part of the omentum. The ileum was united to the descending colon with a Murphy button. The wound suppurated, and a fecal fistula was formed which took several months to close, the patient making, finally, a complete recovery.

Anatomical Diagnosis.—The ileum had been cut near to the ileocecal valve, and the section of the large intestine was made through the descending colon about at the splenic flexure. The walls of the intestine were infiltrated by a cylindrical-cell epithelioma.

VI.—EXTIRPATION OF THE CÆCUM WITH ARTIFICIAL ANUS, FOLLOWED BY SECONDARY ENTERORRHAPHY.

CASE XLV.—(Maydl.) Male, aged fifty-four years. For the last eight months complained of digestive disturbances. Pains in the sacral region. For the last four months micturition has been painful. The patient's general health was poor, and the skin yellowish. In the right inguinal region a tumor can be made out.

Incision along the external border of the right rectus. The growth could not be drawn out of the wound. The omentum, adherent to the growth, was ligated and excised. Section of the ileum. Ligature of the mesentery and layers of the mesocolon. Section of the ascending colon. Ileum greatly dilated. Artificial anus.

Second operation. Resection of the intestine and end-to-end anastomosis. About three weeks later the patient left the hospital with a fistula, which was not closed because secondary neoplastic nodules were found in the neighborhood.

CASE XLVI.—(Riedel.) Male, aged fifty-one years. Digestive disturbances for the last two years. For the last six months the patient has noticed the presence of a tumor in the iliac fossa. It was movable and about the size of a fist. Patient very thin.

On opening the abdomen, a tumor was found involving the cæcum, but, on account of the adhesions, a portion of the ileum and transverse colon had to be removed. An artificial anus was made for fear of gangrene on account of the great amount of resected mesentery. Second operation. Without opening the peritoneum, an end-to-end anastomosis was performed. A few weeks later a spur formed; both ends of the intestine were detached and resected, and an end-to-end anastomosis done. Recovery.

CASE XLVII.—(Hahn.) Male, nineteen years old. For a few weeks there were disturbances in the passage of fæces and loss of appetite. A movable tumor, which felt like a kidney, was found in the epigastric region and could be pushed into the lumbar region.

Incision along the border of the right sacral lumbar mass from the twelfth rib to the iliac crest. The kidney was in its normal position. A transverse incision was then made and the growth was drawn out of it, when it was found that it was situated in the cavity of the cæcum. Both afferent loops were ligated and the tumor was resected. The gut was then sutured to the skin. A little later the enterotome was applied, and at the time at which Hahn published his paper an artificial anus was still present, and a few suspicious nodules were present in the ileum.

CASE XLVIII.—(Barton.) Female, thirty-seven years old. Habitual constipation. A marked stricture of the ileocæcal valve, which appeared to be superficial. The stricture was dilated and an improvement of six months' duration took place. Artificial anus. The second operation consisted in resection of the gut, and an artificial anus was established. This was closed later on by the enterotome. The resected growth proved to be an epithelioma of the ileocæcal valve. Cure.

CASE XLIX.—(MacCormac.) Male, thirty-six years old. Pain in the umbilical region. Five months ago had bloody stools. A tumor could be felt in the right inguinal region which was movable transversely and cylindrical in form.

Median incision. The invagination of the cæcum, which contained a carcinoma, was reduced and the cæcum resected. Artificial anus.

Second operation a few weeks later. Resection of the artificial anus. End-to-end anastomosis with Senn's bone plate. An attempt was made to invaginate the small intestine into the large Lembert sutures.

Fæcal fistula resulted, and an unsuccessful plastic operation was performed to close the fistula, which closed spontaneously some months later.

CASE L.—(Mayo Robson.) Patient had lost his strength and flesh. For the last six months suffered from constipation, vomiting, and abdominal pain. During the last two months these symptoms had become more severe, and for the last three days fæcal vomiting occurred. When admitted into the hospital, he was weak and thin. Abdomen distended.

especially on the left side, where a hard tumor could be felt along the course of the ascending colon.

An artificial anus was made because the patient was too weak to undergo a more serious interference; but before the distended cæcum was sutured to the abdominal opening, a finger was passed into the peritoneal cavity, which located the tumor which had been felt by palpation in the ascending colon. A drain was placed in the intestine, and the patient improved so that in three weeks he was well enough to undergo a second interference. The intestine was rapidly detached and resection of the cæcum and colon was done. When the vessels of the mesocolon were tied, the ends of the gut were united by a decalcified bone plate. The wound united well and the patient increased in weight. Natural functions of the intestines began four days after the operation. Six months later the patient was still in good health.

The growth was an epithelioma which had completely obliterated the lumen of the colon.

VII.—EXTIRPATION OF THE CÆCUM WITH ARTIFICIAL ANUS.

CASE LI.—(Trombetta.) Extirpation of the cæcum for carcinoma. Artificial anus. Death from rupture of the intestine.

CASE LII.—(Whitehead.) Male, thirty-eight years old. Has suffered for eighteen months from pain in the right lumbar region. An ileocæcal tumor which was movable, hard, and painless. Periodical attacks of colic. Diarrhoea and loss of flesh.

Abdominal incision along the outer border of the rectus. Section of the intestine and artificial anus. Death on the thirteenth day.

Autopsy.—Large suppurating focus in iliac fossa.

CASE LIII.—(Sacre.) Female, twenty-five years old, without any antecedents; symptoms began suddenly two years ago. Attacks of colic preceded and accompanied with chills and violent fever. Movable tumor in the ileocæcal region. Biliary and fæcal vomiting, with symptoms of internal strangulation.

Abdomen opened by incision on external border of rectus. Small intestine greatly distended, large intestine collapsed. Carcinomatous growth of cæcum occluding the entire lumen of the small intestine. Extirpation of cæcum and artificial anus. Patient died in the night.

CASE LIV.—(König.) Male, forty-eight years old, having abdominal symptoms for a year. A movable and irregular tumor in the region of the iliac crest. Incision of abdomen made over the growth, which proved to be a carcinoma of the cæcum. Fifteen centimetres of the intestine were resected, and both ends were sutured in the incision because it was impossible to bring them together for anastomosis. Death on the fourth day from gangrene of the colon which was produced by removing too much of its meso.

Autopsy.—Peritonitis and retroperitoneal abscess.

CASE LV.—(Kanthack and Farnivall.) In this case an artificial anus was simply made for a myxosarcoma of the cæcum. The patient died fourteen months afterwards.

CASE LVI.—(Morton.) Male, twenty-seven years old. Intermittent pains in the right iliac fossa for five months, accompanied by a tumefaction situated between the anterior superior iliac crest and the umbilicus. The tumefaction would disappear when the pain stopped. For the last eight days the patient complained of generalized abdominal pains, vomiting, and constipation. The first operation was done on October 17, 1894, and after the abdomen was opened a malignant tumor was found seated at the junction of the cæcum and ascending colon. The growth was adherent to the deep structures of the iliac fossa. Artificial anus.

The patient returned on January 20, 1895, because he had had continuous vomiting for the last week. Symptoms of intestinal obstruction. Nodules of the growth in the cicatrix of the incision. The tumor has increased in size.

The second operation was then done, and consisted in an anastomosis of the sigmoid flexure and ileum with a Murphy button. It was found impossible to unite the small intestine to the ascending or transverse colon. Recovery. A short time after this the growth of the cæcum invaded the skin around the artificial anus; the inguinal glands on the right became enlarged, and the patient died three months after the second operation.

Autopsy.—The entire peritoneum of the intestine of the lower half of the abdomen was infiltrated by the growth. The anastomosis had been done just above the ileocæcal valve. The cæcum was completely filled by the growth with the exception of a small excavation in the growth itself. The anastomosis button was found in another cavity at the junction of the ileum with the cæcum.

CASE LVII.—(Kaummer.) Lateral ileocolostomy and exclusion of the cæcum with extirpation of the ascending colon was performed for carcinoma. The patient recovered.

CASE LVIII.—(Sargon.) Ileocolostomy with Murphy's button for carcinoma of the cæcum. Recovery.

We will here append a few cases where exploratory incision was only done, and will conclude by a *résumé* of a case reported by Homans in which partial resection was performed.

CASE LIX.—(Adam.) Exploratory laparotomy revealing a carcinoma of the cæcum which was inoperable. There was no occlusion and no colic. The growth was adherent to the abdominal wall, and metastasis had already taken place in the lymphatics.

CASE LX.—(Adam.) Exploratory incision for carcinoma of the cæcum. Intestinal occlusion. Metastasis in the lymphatics and peritoneum. Death two days after the operation.

CASE LXI.—(Caird.) Patient complained of pains and swelling on right side of abdomen. Two months ago he had a supposed attack of appendicitis with chills, vomiting, and pain. The tumefaction changed its size and became badly limited and felt soft by palpation. Exploratory

incision. The cæcum, colon, and mesenteric glands formed such a mass that no operation could be attempted, and the abdomen was closed. The patient rapidly recovered from the operation and died six weeks afterwards.

CASE LXII.—(Homans.) Female, aged five years. Since January, 1896, patient complained of an abdominal pain and lost flesh rapidly. The appetite continued to be good, however. A solid movable tumor was found in the region of the appendix simulating a movable kidney. It was slightly painful on pressure. Diagnosis uncertain. It was thought that the tumor might be an appendix, but on account of the absence of pain, it was thought that the growth was more likely a carcinoma, sarcoma, or tuberculosis of the cæcum, which could be explained by the rise in temperature and the presence of a small quantity of liquid within the abdomen.

The abdomen was opened on March 20, in the Trendelenburg position. It was then found that the growth had left the cæcal region and was nearly in the epigastrium. As the growth could easily be brought to the median line, an incision was made in the linea alba between the umbilicus and the pubis, and the growth was found to be a sarcoma which surrounded the anterior wall of the cæcum. About a litre and a half of ascitic fluid was evacuated. The tumor was slightly adherent to the ileum and had invaded the wall of the cæcum and the ileocæcal valve. About three centimetres of the anterior wall of the cæcum and a portion of the valve were resected, and the opening into the gut was closed by two layers of continuous Lembert sutures. A small wick of gauze was laid on the intestinal suture, and made its exit through the abdominal wound. Recovery.

The growth consisted in a lobulated mass the size of a potato. Part of the intestine adhered to it intimately, the walls being infiltrated by the growth from without inward. Microscopically, a diagnosis of a sarcoma of small fusiform cells was made.

Fourteen months after the operation the child was in good health.

ADDENDUM.

THE following cases have either been published since this article went to the publishers or had been overlooked, so that we will add them here.

CASE I.—(Mayo.) Male, aged thirty-eight years. History of colicky pains in abdomen for four years. While not severe, the pain has been persistent, and during the past year has become located in right side. For four months diarrhœa has been persistent, and the patient has lost forty pounds in weight. Family history negative.

Examination showed a moderately emaciated man of cachectic appearance. No evidences of disease of organs outside of the abdomen. Tem-

perature and pulse normal. There is considerable intestinal distention, and peristaltic waves can be seen, accompanied by marked gurgling. An induration can be felt on deep palpation in the right side, evidently connected with the cæcum. It is about the size of a small lemon, firm to the touch, and not very sensitive. Upon the history and physical signs the diagnosis of appendicitis appeared warranted, and was thought to be probably due to tuberculosis, while the obstruction might be accounted for by adhesions.

A lateral incision revealed a nodular tumor of the cæcum involving the appendix and ileocæcal juncture. A few enlarged glands could be felt behind the bowel. An incision through the peritoneum was made on the outer side, and the cæcum with the enlarged glands was lifted out through the incision. Ligature of the vessels supplying the part. The ascending colon was divided two and a half inches from the tumor, and its distal end closed with a circular suture. The proximal end was clamped. The mesentery was progressively ligated and the ileum divided eight inches above the ileocæcal valve. An attempt was made to join the end of the ileum to the side of the ascending colon, but, as there was some tension, the divided end was turned in with a circular suture. The omentum was raised, and the side of the ileum six inches above its severed extremity was anastomosed to the transverse colon near the hepatic flexure with a Murphy button. A small drain was introduced into the right side and the incision closed.

Recovery uneventful, and the patient left one month later. He rapidly gained his usual weight and strength, and two years later was pursuing his work in better health than for years.

CASE II.—(Mayo.) Male, thirty years old. For the past six months has suffered from cramps in the abdomen, with a feeling of weakness. For the last three months the pain has been nearly constant in the right side, losing weight and strength, constipated. Family history good.

Examination showed a man of good physique, somewhat emaciated, walks with the right thigh drawn up to relax the psoas and iliacus muscles. Temperature and pulse normal. No evidences of disease outside the abdomen. There is some tympanites. On deep pressure on the right side a small mass can be detected which is tender to the touch. Diagnosis, chronic appendicitis.

An intermuscular incision was made, and a tumor involving the cæcum, appendix, and lower ileum was exposed. The incision was lengthened, cross-cutting the deeper muscles. The peritoneum was divided outside, and the cæcum, appendix, ascending colon, and fourteen inches of the ileum were excised, a lateral anastomosis between the lower ileum and transverse colon being effected. There was extensive adhesion posteriorly in the mesentery, necessitating the extensive resection. A few small glands were found. A small drain was introduced and the incision closed. Patient discharged in eight weeks in good condition.

CASE III.—(Bernays.) Male, fifty-four years old; was sent with a diagnosis of chronic appendicitis. A hard nodule in the right iliac fossa could be felt, but a positive diagnosis of chronic appendicitis could not

be made, nor could the conclusion that there was a carcinoma of the caput coli or ileocæcal valve be arrived at.

The abdomen was opened and a large mass consisting of glands was found; the mesocolon and the mesentery were normal. There were only a few small glands. The cæcum and ileum were clamped at right angles, and the entire mass was cut away. The resection was accomplished with scarcely any bleeding, and there was only one large artery which required ligating. Fortunately, the ileum had a long mesentery, and it was freely movable, and the colon also could be turned well out of the wound. Maunsell's operation.

CASE IV.—(Lockwood.) Female, thirty-eight years old. During the summer had had a severe attack of appendicitis supposed to have been brought on by bicycling. Some nine months later a second attack occurred, when an ovoid tumor about three inches long and an inch and a half wide could be felt at the site of the appendix. It was movable, hard, and painful on pressure. Some distention of the intestines and their vermicular movements could be seen through the thin abdominal wall. Solid food increased the intestinal movements and caused pain, especially in the right iliac fossa. By rectal examination, a hard mass could be felt high up on the right side of the pelvis, and was supposed to be caused by the appendicitis.

At the operation the cæcum and ileum were drawn out of the abdomen, and with some difficulty the appendix was found wrapped around the latter. The organ was with some difficulty separated from the ileum and mesentery, and at least three inches of it removed. At its cæcal end a considerable mass of hard tissue was felt in the wall of the cæcum. This was supposed to be inflammatory, but a piece was removed for histological examination. It proved to be a columnar-celled carcinoma undergoing colloid change, and had probably begun in the ileocæcal valve. The patient recovered from this operation and the abdominal symptoms were relieved. The adherent appendix had apparently caused a partial obstruction of the ileum.

About two months later the cæcum was removed, about two inches of the ileum and a portion of the mesentery, including a large gland, were resected. The growth was found at the site of the ileocæcal valve, having probably begun in that structure, which, however, had disappeared. The ileum and cæcum were united by circular enterorrhaphy by the Czerny-Lembert method. Excellent recovery.

Nine months later symptoms of intestinal obstruction, and the rectum was found almost occluded by a mass growing in the right side of the pelvis. Inguinal colotomy.

CASE V.—(Shield.) Patient twenty-seven years old; had felt an enlargement in the right side of the abdomen after the birth of her last child in February, 1896. The tumor was as large as a good-sized orange, hard, and with irregular borders. It could be moved up and down between the umbilicus and the right iliac fossa.

Laparotomy. The tumor was found located in the cæcum, and was resected along with four inches and a half of the ileum and the adjacent

part of the mesentery, which contained a certain number of enlarged glands. Rapid recovery.

CASE VI.—(Belin.) Patient, fifty-four years old; complained of an enlargement in the abdomen, without any other subjective symptoms than an obstinate constipation.

By palpation a tumor could be made out situated about two centimetres below the umbilicus. It felt flattened, was painless, and could be moved in all directions. The diagnosis of tumor of the mesentery was made. Two years later the patient had become thin and looked old. The umbilical tumor had disappeared, but in the right iliac fossa a hard and immovable mass was detected. Pain was continuous and violent, while bilious or alimentary vomiting with alternatives of diarrhœa and constipation tormented the patient.

Six months before, and without any appreciable cause, there had been a severe intestinal hæmorrhage. From time to time the patient had chills and fever.

The abdomen was opened and a hard adherent mass was found in the right iliac fossa. The entire cæcum was included in a neoplastic tissue, while the inflamed and distended ileum had a calibre equal to that of the colon. Resection. Entero-anastomosis.

After the operation the general condition and the temperature remained normal, but on the third day, without any cause, an hæmatemesis developed, which killed the patient.

CASE VII.—(Tansini.) Female, forty-six years old; had always been well. Nine months previously had severe pain in the right iliac region, which radiated towards the corresponding lumbar region and thigh, and was especially marked during defecation. The patient also discovered that the point of tenderness in the abdomen was the seat of a tumor, which on palpation produced severe pain.

This tumor has increased in size rapidly, so that at the time of examination it was quite large, and during its development pains have been continuous. Constipation has been persistent and caused much pain to the patient.

Examination showed a tumor the size of a turkey's egg in the right iliac fossa. Its surface is uneven and its limits badly defined. Above a mass can be felt extending one finger's-breadth below a line passing transversely through the umbilicus. The mass is of a fibrous consistency and cannot be moved. On pressure the pain is intense.

Operation revealed a carcinoma of the cæcum, the neoplastic mass being especially developed on the posterior wall of the organ. Resection of the ileocæcal angle. Circular enterorrhaphy. Recovery uneventful.

CASE VIII.—(Conklin.) Male, aged forty-three years; had fallen in such a way as to strike the right side of the abdomen against the edge of a box, causing considerable pain. The following January he began to have attacks of abdominal pain. On examination a small mass was found, somewhat tender on pressure, in the region of the appendix. The temperature was normal and the pulse nearly so. A marked cachexia was noticed. Later, a large tumor could be easily recognized in the right

iliac region. Then after a prolonged chill, with rapid pulse and rise of temperature and profuse perspiration, an incision was made and a large amount of pus was found, walled in by firm adhesions; and it did not seem wise to disturb these in an attempt to find and remove the appendix. Threatening symptoms of sepsis disappeared at once, and the patient made a rapid recovery, leaving the hospital in about two weeks. The incision was entirely closed, with an apparently firm cicatrix, in about a month.

An attempt was made to resume work, but more or less discomfort was complained of around the scar. Four weeks later a small abscess suddenly developed at one side of the cicatrix, broke, and discharged for a few days. A small fistulous opening remained, with slight discharge of thin purulent fluid, having at times a fæcal odor. This fæcal fistula persisted with marked and increasing infiltration of the abdominal wall about the opening.

Finally, an elliptical incision was made through the skin, outside the mass of indurated tissue which surrounded the fistulous opening. The infiltration had involved fascia, muscle, and peritoneum, making it necessary to sacrifice a large area of abdominal wall. This infiltrated mass was firmly attached to the cæcum, which had through its entire length undergone the same pathological change. Firm and extensive adhesions made its liberation and removal very difficult. Though the difference in calibre between the ileum and the colon increased the difficulty of end-to-end anastomosis, it was finally accomplished by means of the Czerny-Lembert suture. It had been necessary to remove so much peritoneum that it was impossible to bring its edges together for about one-half of the length of the incision. Silkworm gut was used for the remaining sutures, but the tension was so great as to make it necessary to remove most of them two or three days later.

On the day following the operation the patient became very much distended. His pulse increased in rapidity until it reached 160, while the temperature was 103° F. Failing by other means to relieve the distention, an enterostomy was made in the median line, below the umbilicus, suturing the edges of the intestinal incision to the peritoneum and fascia. This was followed by free escape of gas and fæcal matter and immediate relief of distention. The pulse dropped in six hours to 130 and in twenty-four to 112.

Improvement was slow but practically uninterrupted. There was very little, if any, discharge of fæcal matter at the point of anastomosis, but the discharge of pus was free and for a time extremely offensive.

In its centre the edges of the incision were at least four inches apart, but by a gradual process of granulation and contraction a firm and comparatively narrow cicatrix formed in about eight weeks.

The patient left the hospital nine weeks after the last operation, and six weeks later, when the report was made, was apparently in good health.

CASE IX.—(Schiller.) Male, forty-eight years old; complained for a year of a burning feeling in the region of the cæcum, with obstinate constipation and tympanites. In three months the patient lost twenty-five pounds. Patient is thin, but has a general appearance of still fairly good

health. In the right iliac fossa a movable tumor, cylindrical in shape, was discovered. Tympanites and peristaltic contractions of the small intestine were manifest, especially in the umbilical region.

Incision fifteen centimetres long parallel to the crural arch. After the peritoneum was opened, a carcinoma adherent to the mesentery and parietal peritoneum was found, which extended up under the liver in front of the kidney. The adhesions were broken down, a portion of the renal capsule was resected as well as some of the parietal peritoneum and infiltrated tissues in the neighborhood of the crural nerve. The spermatic plexus was partly destroyed, but the ureter was saved. The cæcum and part of the ileum were resected, and circular enterorrhaphy with anastomosis between the ileum and transverse colon was done.

Several days after the operation a stercoral abscess formed, which opened into the lumbar region, and on the fifth day the patient died of diffuse peritonitis.

Autopsy showed generalized peritonitis without exudation, with a retrocæcal abscess produced by gangrene at the point of intestinal anastomosis.

CASE X.—(Schiller.) Male, thirty years old; had been losing flesh for seven weeks, and complained of diarrhœa and tympanites. A slightly movable hard tumor of the cæcum was discovered.

Incision carried parallel to the crural arch. A cylindrical growth, adherent to the mesentery and involving the cæcum and the commencement of the ascending colon, was found. The neighboring lymphatic glands were enlarged. The peritoneal cavity contains quite a quantity of ascitic fluid. Resection, circular enterorrhaphy of the ileum with the hepatic flexure of the colon. Drainage. Recovery. Thirteen months later the patient was in excellent condition.

CASE XI.—(Schiller.) Male, fifty-eight years old. Hereditary antecedents of carcinoma. For the past twenty-five years the patient has suffered from digestive disturbances, especially anorexia. A hard, movable tumor of the cæcum was found, it being about the size of an egg.

Incision in right iliac fossa. Resection of twelve centimetres of the intestine, including the cæcum, part of the ascending colon, and three centimetres of the ileum. Some enlarged glands of the mesentery were also removed. Circular enterorrhaphy. Gauze drainage.

Histological examination of the growth showed it to be carcinoma. Patient died a few days later of septic peritonitis.

Autopsy revealed diffused peritonitis, sutures in excellent condition. Œdema of both lungs.

CASE XII.—(Tchouprow.) Patient, twenty-eight years old, with tumor situated in the right iliac region; has complained of intense pains occurring periodically. Patient thin and weak, straw-colored integuments.

Inspection of the abdomen shows on the right, at the level of the anterior superior iliac crest, that the abdominal wall is pushed up by an oval tumor during the movements of respiration. The size of the growth is about that of an apple, its surface uneven and of a hard consistency.

The external border is irregular, but the growth may be seized between the fingers and moved up and down, but less easily laterally.

The patient had had up to this time alternating diarrhœa and constipation. At the age of twenty-three he had had dysentery, which lasted two weeks. Two years later he had pain in the right iliac region occurring about every two weeks, either in the night or in the day.

The abdomen was opened and the cæcum found increased in size; the tumor was hard and granular to the feel. Resection. Lateral enterorrhaphy. Cure.

Anatomical diagnosis, adenocarcinoma of the cæcum.

CASE XIII.—(Demons.) Female, thirty-six years old; had a painful tumor in the right iliac region, which made its first appearance about three years ago, and was diagnosed as a floating kidney.

Operation for nephrorrhaphy was undertaken, but during the operation the diagnosis was rectified, and the growth removed through a large incision with such ease that the author recommends the posterior lateral incision as a very excellent route with which to attack the cæcum.

The growth involved the lower part of the ascending colon and the cæcum, all of which were extirpated. Oblique section of the ileum. Circular enterorrhaphy. Drainage. Wound united by first intention, but the drain opening remained fistulous.

Anatomical diagnosis, epithelioma of the cæcum.

CASE XIV.—(Storchi.) Male, forty-two years old; had complained of pains in the right iliac fossa for six months. Diarrhœa and constipation. Several intestinal hæmorrhages. Distention of the abdomen. Palpation produced pain in the right iliac fossa, and a tumor the size of an orange—oblong, movable, and non-fluctuating—was discovered. Percussion is not related to the liver.

Laparotomy. A growth localized to the ileocæcal valve was found adherent to the mesentery. Resection. Circular enterorrhaphy. Cure.

Anatomical diagnosis, adenocarcinoma, starting in the ileocæcal valve.

CASE XV.—(Storchi.) Male, forty years of age; complained of abdominal pain with diarrhœa and intestinal hæmorrhage for three months. For the last six weeks patient has noticed a tumor the size of a small apple in the right lumbar region. The growth has increased in size, is painful on pressure, surface unequal, consistency hard, and the tumor is elongated in a longitudinal direction. It has a limited mobility in all directions. The abdomen is painful on palpation.

Laparotomy. The growth is bound by numerous adhesions to the small intestine, transverse colon, and mesentery. Resection. Circular enterorrhaphy. Patient discharged well in twenty-five days.

Anatomical diagnosis, adenocarcinoma of the ileocæcal valve.

CASE XVI.—(Nélaton.) Male, forty-three years old. In June, 1896, was suddenly taken with colic and vomiting accompanied with diarrhœa. These symptoms lasted for two days and ceased spontaneously. Remained well for three weeks, and then was taken with constipation, colics, and vomiting. These symptoms disappeared in three days after the use of a

purgative. These attacks occur at variable intervals, during which the health is very good and no abdominal pains present.

In November, 1896, severe constipation, colicky pains, and vomiting, which was twice fecaloid.

Patient entered hospital on December 1 in an advanced condition of cachexia due to a complete occlusion, with vomiting of twelve days' duration. Immediate colotomy of the cæcum. Improvement. Three months later the abdomen was opened in the region of the artificial anus, and the cæcum and lower end of the ascending colon were resected. Circular enterorrhaphy, with the use of Souligoux's sugar tubes. Small gauze drain. Recovery.

Anatomical diagnosis, carcinoma of cæcum and ascending colon.

CASE XVII.—(Nélaton.) Male, forty-nine years old; suffering from intestinal occlusion, which had been present for four days. For the last three or four years the patient had had dyspepsia and prolonged constipation.

Incision in the right iliac fossa. The cæcum was not distended, but by careful examination a hard mass bound down the terminal end of the small intestine to the superior strait. The neoplasm was about the size of a crab-apple. An artificial anus was made in the gut immediately above the growth.

About a year and a half later, as the tumor had increased in size and as the general condition of the patient was good, a radical operation was undertaken. A large elliptical incision circumscribing the artificial anus was made, and terminal portion of the ileum and the cæcum were drawn out of the wound. Resection. Circular enterorrhaphy.

Patient died on the fifth day from peritonitis, due to gangrene of the bowel at the suture points. Histological examination showed a cylindrical cell epithelioma of the ileocæcal valve.

CASE XVIII.—(Delaunay.) Female, forty years old. About two months ago complained of vague and radiating pains, sometimes in the right iliac fossa, at others on the left side of the abdomen. The pains were at times very severe. A month ago consulted a physician, who found a deep-seated enlargement in the right iliac fossa. Other than a slight constipation, there were no digestive disturbances.

The patient was then suddenly attacked with what appeared to be appendicular colic, which lasted all night. Severe vomiting. Tympanites and tender abdomen. The cæcum was distended. Severe pain localized in the right iliac fossa. The attack terminated about six o'clock in the morning by a free diarrhoea. No fever. Although the patient had lost flesh latterly, the general health appeared good.

Examination of the right iliac fossa showed that the region was very sensitive. Dulness on percussion. A deep-seated tumor could be felt, hard, slightly irregular, and about three fingers' breadth in diameter, extending towards the pubis. The abdominal wall was not adherent to the tumor, and the growth itself appears to be somewhat movable. Diagnosis of appendicitis was made, but with reserve.

Roux's incision for appendicitis, and immediately the infiltrated

cæcum came into view. The neoplasm appeared limited, and was movable and only slightly adherent. The cæcum was freed and resected. Lateral anastomosis with Murphy's button. Gauze drainage. Recovery.

Anatomical diagnosis, cylindrical cell epithelioma.

CASE XIX.—(Boeckel.) Female, forty-seven years old. The commencement of the disease was ushered in by digestive troubles, consisting of anorexia, frequent diarrhœa, and hiccough after eating. Pain in the right iliac fossa, loss of flesh.

About eight months later the symptoms became more marked; there was severe colicky pains, principally located in the right iliac fossa, and for the first time a movable tumor was noted in the region of the cæcum. It was hard, irregular, and about the size of an adult's fist. It was movable, and could be brought over to the median line. Marked cachexia. Diagnosis of carcinoma of the cæcum or of the ascending colon was made.

At the operation the cæcum and part of the ascending colon were resected; the cæcum was invaginated in the colon, and this invagination was due to cicatricial retraction of certain ulcerated portions of the growth. The resection included ten centimetres of the ileum and fifteen centimetres of the colon, including the cæcum. The tumor developed one centimetre and a half above Bauhin's valve, and was composed of a number of lumps, forming a tight ring around the entire lumen of the colon, about four centimetres in breadth. The stricture of the gut was such that the small finger could not pass through it. The patient died five days later.

CASE XX.—(Chaput.) Male, aged thirty-two years. Mother died at thirty-three years of age from cancer of the rectum, and the grandmother at sixty-five years of age from carcinoma. The disease began two years ago, with mild digestive disturbances. After three or four months colicky pains appeared, and the abdomen became distended after each meal. Little by little the colicks became more frequent and severe. The gas accumulating in the right iliac fossa produced considerable swelling, and at this time pain occurred in this region. The patient gradually lost flesh. The stools were regular, but in small amount, extremely fetid, loose, and containing undigested food.

By palpation a large growth was felt in the right hypochondrium. Its limits were irregular; it was hard and unequal. The skin was movable over the mass. The growth was quite movable, but it was found to be adherent to the posterior abdominal wall. It extended transversely from the anterior superior iliac crest to within an inch of the umbilicus, and vertically from McBurney's line to the costal border, under which it seemed to extend. By deep inspiration the lower border of the liver could not be felt. Diagnosis, tumor of the cæcum and ascending colon, probably carcinoma.

Vertical incision along the external border of the rectus; difficult enucleation of the tumor, which formed an enormous mass and was accompanied by hæmorrhage. Resection. Anastomosis with a No. 3 Chaput's button. The patient suddenly died two days later; probably from an embolus, as no autopsy could be obtained.

CASE XXI.—(Pilcher.) Male, aged fifty-three years. Within two years the patient had had three attacks simulating appendicitis. Five weeks before admission to hospital he had had such an attack with pain and tumefaction in the right iliac region, fever, vomiting, and constipation. When admitted, the acute symptoms had subsided, but palpation revealed in the right iliac region a moderately tender tumor. An operation for chronic appendicitis was undertaken, but upon opening the abdomen it was evident that the lesion was a carcinoma of the ileocæcal junction of the intestine. The growth was not then removed because the patient's consent to such an operation had not been received. The abdomen was closed. Ten days later excision of the growth was proceeded with. The cæcum and adjacent portion of the ileum, including the tumor-bearing section of intestine, were removed, and the cut end of the ileum was implanted into the side of the ascending colon, whose open end was invaginated and sutured. The growth was found to have had its origin from the ileocæcal valve. It lay in contact with the sigmoid flexure and with the summit of the bladder, to both of which parts the carcinomatous process had extended. No attempt to attack the sigmoid or bladder disease was made. Gauze drainage from the site of the excision was provided. The patient remained in a depressed state, and on the third day after the operation died. Autopsy demonstrated the local conditions to be in a satisfactory state.

ELBOW FRACTURES IN CHILDREN.

FRACTURES OF THE LOWER END OF THE HUMERUS; LESIONS
AND END RESULTS, AND THEIR BEARING
UPON TREATMENT.

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(Continued from page 104.)

SUPRACONDYLAR FRACTURES.

THIS form of fracture, one of the commoner forms, has been theoretically divided into the fractures by extension and those of the so-called flexion type. This division comes from Kocher, and, so far as his writings show, has no other than an experimental basis. At all events, the distinction does not seem to be clinically defensible, and the cases here given are grouped irrespective of any attempt at such division.

CASE XVII.—W. C., aged nine years. Fracture at elbow. Ether; fracture of lower end of humerus down and forward and inward, with backward displacement of the lower fragment. Fracture across the *whole* shaft. Internal angular splint. Skiagraph taken.

Five days. Some deformity. Reduction attempted without ether, by traction forward. Internal angular splint with adhesive plaster to keep up the traction. Skiagraph confirms the diagnosis; the fracture runs downward, forward, and inward to emerge close to the internal epicondyle, the epiphysis of which is apparently included in the lower fragment.

Nine days. The position seems to be good.

Fourteen days. Position good. Rather excessive callus.

Nineteen days. Still much callus. Flexion 10° , extension 30° , pronation slightly limited, supination normal. No joint effusion.



FIG. 22.—Case XVII (just after injury).

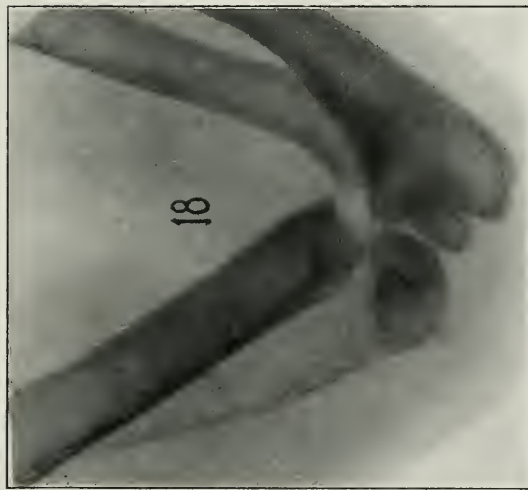


FIG. 24.—Case XVIII.



FIG. 26.



FIG. 28.—Case XX. Arrows show line of fracture.

Twenty-four days. Flexion to 20° , extension 40° .

Thirty days. Motions as before. Splint omitted. Massage and passive motion begun.

Thirty-eight days. Extension freer.

Eighty days. Flexion 10° , extension normal, pronation

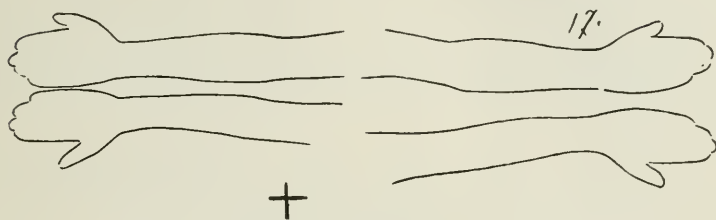


FIG. 23.—Tracings in Case XVII (at eleven months).

nearly normal. Supination normal. Callus still obvious. No widening of elbow.

Re-examined at eleven months.—Function absolutely normal. Flexion very slightly limited,—not over two or three degrees; extension exactly normal, pro- and supination normal. Callus entirely gone. Cubitus varus of moderate grade; part of “carrying angle” lost. (Fig. 23.)

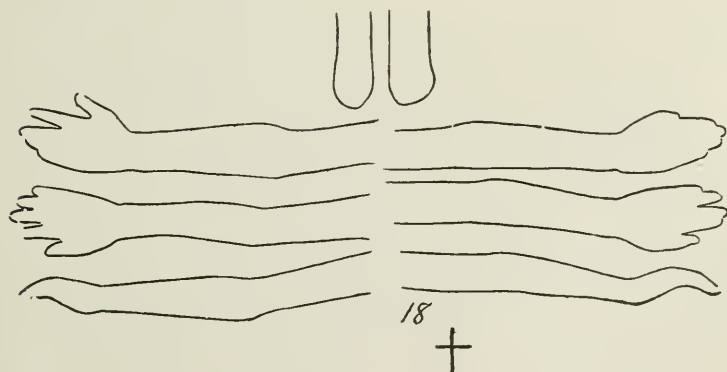


FIG. 25.—Case XVIII (after seventeen months).

CASE XVIII.—H. I., aged eight years. Fracture of left humerus at the elbow just above the joint. (Fig. 24.)

Twenty-eight days. Much callus involving the whole bone above the joint.

Thirty-two days. Good position; flexion to right angle only; apparatus removed. Sling.

Thirty-seven days. Flexion to 45° . Much callus. Massage and passive motion begun.

Forty-eight days. Flexion 40° , extension 40° beyond right angle. Callus less. Massage and passive motion regularly carried out for nearly three months after this, then continued still longer at home.

Re-examined at seventeen months.—Function normal. Flexion normal. Extension limited at about 10° from the straight line. Rotation normal. Some loss of the "carrying angle." (Fig. 25.)

CASE XIX.—E. H., girl of three years. Fell out of bed. Ether; supposed to be a separation of the whole humeral epiphysis. Put in acute flexion. Skiagraph taken.

Six days. Changed to internal angular splint at a right angle. The skiagraphs show a transverse fracture through the diaphysis just above the line between the two condyles. (Fig. 26.)

Eleven days. Swelling has gone down. Position good.

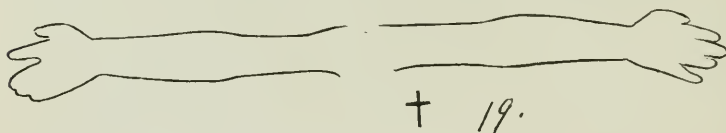


FIG. 27.—Case XIX (at one year).

Sixteen days. 15° of free motion. Considerable thickening.

Twenty-three days. Motion of 15° - 20° .

Thirty-two days. Extension only to 35° beyond a right angle. Flexion about 10° . Pro- and supination free. Splint removed. Sleeve to be pinned up as a sling for a few days.

Thirty-nine days. Arm used pretty freely. Flexion about 30° , extension now to within 15° or less of the straight line. Rotation normal. Some thickening still present. Tracings taken; they show distinct gunstock deformity of moderate grade.

Re-examined one year later.—Function normal. Flexion limited only two or three degrees. Extension normal—hyperextension possible. Pro- and supination normal. Moderate gunstock deformity. (See tracing, Fig. 27.)

CASE XX.—M. K., girl of five and a half years. Fell while playing, and in falling struck right elbow on a plank—struck on the *inner* side of the elbow. Next day came to the hospital. Arm somewhat lame. Motions normal except as limited by the swelling. Some effusion into and about the joint. Examined thor-

oughly, though, without ether, and no sign of fracture was found beyond slight local tenderness. Diagnosis withheld. Arm put up in acute flexion. Sent for skiagraph.

Five days. Skiagraph shows a distinct fracture just above the condyles apparently running across the whole bone. (Fig. 28.) (The line is, of course, much more distinct in the negative than in the print.) There is no sign of displacement. Clinically there is a good deal more swelling and some extravasation of blood on the *inner* side of the elbow above the inner condyle. No

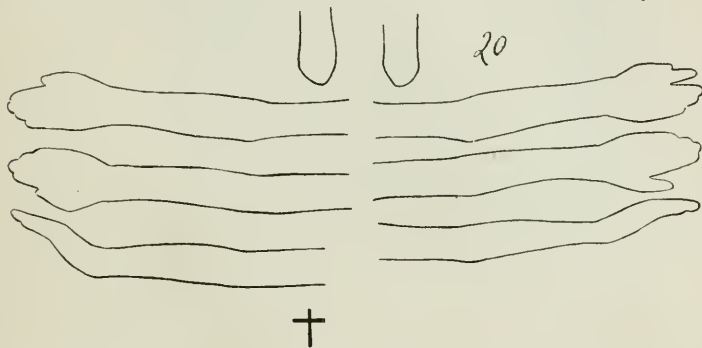


FIG. 29.—Case XX (tracings after three and a half months).

callus to be felt, no tenderness, almost no pain. Put up at an acute angle. Did not return.

Re-examined three and a half months later.—Function perfect. Flexion limited a few degrees only, practically normal. Extension normal, some hyperextension. Pro- and supination normal. Slight thickening at and just above the condyles. Slight atrophy of muscles of upper arm. *No deformity.* (Fig. 29.)

CASE XXI.—M. C., girl of two years. Fell, striking on the elbow. Accident room record alleges a separation of the epiphysis of the lower end of the humerus (left). X-ray taken. Put up at a right angle.

One day. Good position.

Three days. Skiagraph shows a transverse fracture through the diaphysis well above the epiphyseal line; backward displacement of not over one-tenth inch without any rotation. Splint reapplied. (Fig. 30.)

Nine days. Considerable callus above the joint. Position perfect. Flexion 25°, extension 40°. Rotation free. No pain or spasm on attempted motion. Splint reapplied.

Eighteen days. 90° of motion. Massage begun, but without passive motion. Splint. Splint reapplied.

Twenty-three days. Flexion 35° - 40° , extension 45° . Position perfect. Splint omitted. Sling.

Twenty-seven days. Callus diminishing. Flexion practically normal. Extension readily forced to 60° . Massage continued. Sleeve pinned up as sling.

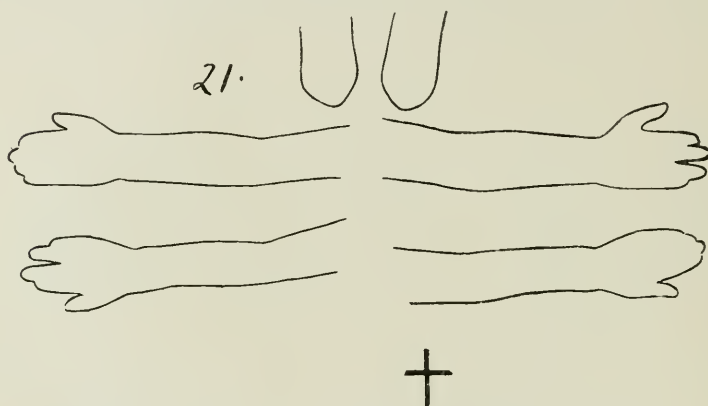


FIG. 31.—Tracings in Case XXI (after eleven months).

Thirty-two days. Callus no longer to be felt. No deviation in axis of arm and forearm. Flexion full normal. Extension to 180° . Discharged well.

Re-examined at eleven months.—Function perfect. Motions all literally normal. Arm shows perhaps a faint thickening just above condyles, but not enough to be sure of. No deformity whatever. (Fig. 31.)

CASE XXII.—H. H., aged nine years. Was standing in a hammock and fell out, striking on his left elbow. Ether; flexion of the joint much limited, extension somewhat limited. About an inch above the condyles the upper end of the lower fragment is felt behind. At a corresponding point anteriorly the lower end of the upper fragment projects. Posterior displacement is marked. Reduced. Put up at a right angle in an internal angular splint with a long posterior splint to the upper arm.

Two days. Considerable swelling. X-ray shows a rotation inward of the lower fragment (with some total backward displacement persisting). (Fig. 32.)



FIG. 30.—Skiagraph of Case XXI (three days after injury).

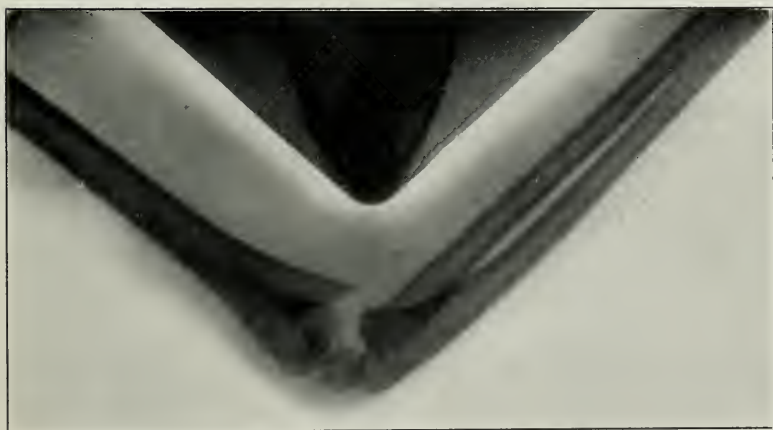


FIG. 32.—First skiagraph of Case XXII.



FIG. 33.—Case XXII at fourteen days (after second reduction).



FIG. 35.—Case XXIII.

Ten days. Attempt to secure better position by traction and rotation of the lower fragment. Arm put up in plaster with the hand carried *in front*, not against the body.

Fourteen days. Skiagraph now shows position perhaps improved, but not satisfactory. (Fig. 33.)

Twenty-three days. Discharged to Out-patient Department. "May have to return later to have a bit of upper fragment cut away if flexion of arm is much limited."

Thirty days. Marked projection outward above the external condyle. Rotation free. Flexion 10° beyond right angle. Extension only 15° . External condyle lower than normal and lies farther inward. Splint reapplied.

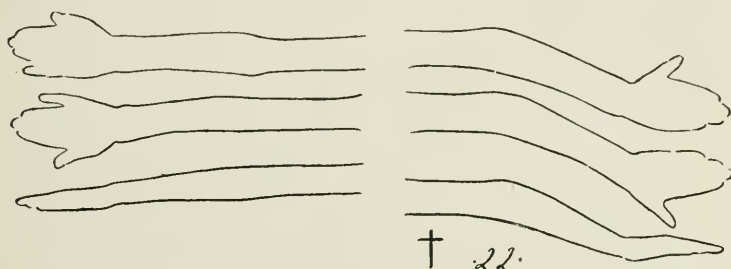


FIG. 34.—Case XXII (after one year).

Thirty-four days. Motion the same.

Forty-four days. Motion of 15° - 20° only. Pronation and supination limited to about three-fourths the normal. Splint continued.

Forty-eight days. Splint omitted.

Looked up one year later.—Function perfect. Flexion 25° beyond the right angle. Extension normal; some hyperextension. Pro- and supination normal. A good deal of thickening above the joint on the outer side. Extreme gunstock deformity. (See tracing, Fig. 34.)

CASE XXIII.—J. H., boy of twelve years. Fracture of elbow above the joint. Ether; reduced; put up in acute flexion; skiagraph taken. (Fig. 35.)

Eleven days. Considerable thickening above the elbow. Acute flexion continued. Position seems good.

Fourteen days. Much thickening, especially on the outer side. About 10° of motion.

Twenty-four days. Flexion 10° , extension to near a right

angle. Pronation and supination about one-half normal. Callus may be traced from above the external condyle running across beyond the middle line.

Thirty-one days. Flexion 40° , extension as before. Pro- and supination normal. Hand let down into a sling.

Three months. Flexion 50° from right angle (*i.e.*, normal). Extension still only 40° . Rotation normal. Callus persists. To stretch the arm by carrying weights.

Three and a half months. Motion a little better. Flexion 45° , extension 50° . Gunstock deformity considerable.

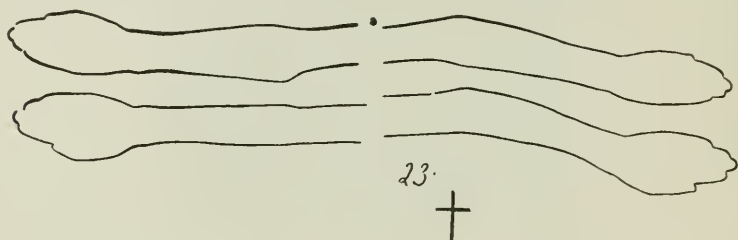


FIG. 36.—Tracings in Case XXIII (at six months).

Four months. Flexion 45° , extension 70° .

Four and a half months. Flexion normal. Extension nearly normal. Callus still considerable. Moderate. Moderate gunstock deformity.

Six months. Function normal. Flexion normal. Pro- and supination normal. Extension about 15° short of normal. No local deformity. Gunstock deformity marked,—a reversed angle of about 15° . (Fig. 36.)

CASE XXIV.—E. G., boy of eight years. Fell on the sidewalk, striking his elbow. Reduced in the accident room under ether. Then diagnosed as a T-fracture. Put up in acute flexion. X-ray taken.¹

Sixteen days. Much swelling of the joint and a good deal of thickening of the whole lower end of the humerus. Some tendency, apparently, to forward displacement of the lower fragment. Acute angle changed for a right angle, internal angular splint.

Twenty-two days. Good union; still much swelling; considerable thickening about the internal condyle.

¹ X-ray showed (in lateral view) a supracondylar fracture, not a T. not far above the joint, oblique down and in; displacement backward. Negative lost later: this from notes.

Thirty-five days. The callus, which is heavy, is to be felt across the whole width of the bone. There is, however, no widening of the joint and nothing to show for the alleged T-fracture. Moreover, the X-ray plate shows a distinct fracture running from above the external condyle down and in to a point just above the internal epicondyle, but no sign of a break between the two condyles. Flexion now to a right angle only. Extension only 20° - 25° from the right angle. Pro- and supination are normal. Has begun massage and passive motion. Splint omitted.

Forty-two days. No gain in motion. To resume splint and drop passive motion for a week, since the hinderance to motion (beyond an arc of 30°) is a sharp *muscular* spasm.

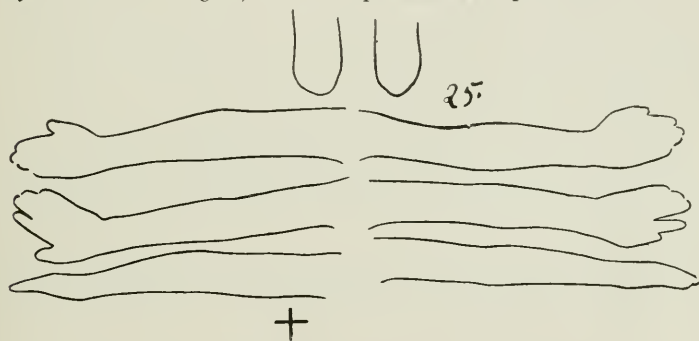


FIG. 37.—Case XXV (at sixteen months).

Fifty days. Motion not improving much. Comes regularly for massage. More muscular atrophy of the whole arm than is usual.

Fifty-three days. Returns from the neurologist with a negative report in reply to a question of possible nerve lesion. Did not reappear.

Re-examined eleven months later.—Function perfect. Flexion to 40° beyond a right angle. Extension 10° short of the straight line, limited by bone, to judge by the feeling. Pro- and supination normal. Still a trace of the callus. A slight forward displacement of the lower fragment easily made out by palpation at the outer side. This evidently accounts for the slight loss of motion. There is no spur present. The carrying angle of the two arms shows literally *no* difference whatever. No tracing taken.

CASE XXV.—C. D., aged six years. Transverse fracture of

the humerus one inch above the condyles. Put up in an internal angular splint.

Seven days. Good position.

Nineteen days. Much thickening about lower part of humerus. Position seems good; union solid; swelling still considerable.

Twenty-six days. Passive motion begun, but splint continued.

Twenty-nine days. Flexion to 25° . Callus now more readily palpable; runs slightly down and inward across whole width of bone above the joint.

Thirty-eight days. Tendency to gunstock deformity. Otherwise satisfactory.

Forty-three days. Flexion only 20° , extension to 25° , rotation normal. Sling only.

Forty-seven days. Flexion 20° , extension 45° . Sling.

Fifty-six days. Flexion 25° , extension 45° .

Seventy days. Flexion 25° , extension 65° or 70° , pronation limited one-third, supination normal. Decided but moderate gunstock deformity.

Eighty-five days. Flexion well beyond a right angle. Extension practically normal. Rotation normal. Moderate gunstock deformity.

Re-examined at sixteen months.—Function perfect. Flexion normal, extension normal, with the full hyperextension preserved, pro- and supination normal. Callus about one inch above the joint on the external side. None to be felt internally. Gunstock deformity present (about 15° of reverse angle). (Fig. 37.)

CASE XXVI.—L. M., aged three years and three months. Fall on elbow. Diagnosed by the writer as an oblique fracture up and outward just above the elbow-joint. Put up at a right angle.

Fourteen days. Much callus above the joint; flexion free for 30° , extension 30° beyond right angle, pro- and supination free.

Twenty-nine days. Much thickening of whole lower end of humerus. Motion increased in flexion and extension. Splint omitted; bandage, massage, and passive motion.

Thirty-one days. Flexion and extension about normal.

Re-examined at fourteen months.—Motions absolutely nor-

mal; extension with a slight twist—the common spiral motion of cubitus varus. Distinct thickening, evidently from new bone only; distinctly above epiphyseal line. No displacement to be made out

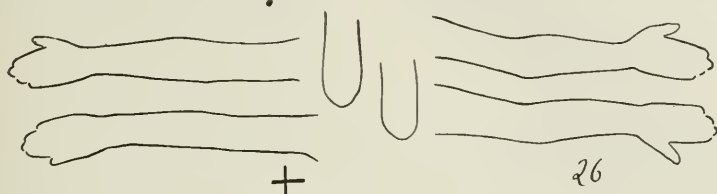


FIG. 38.—Case XXVI (tracings at fourteen months).

by palpation. Gunstock deformity only to the extent of loss of the normal carrying angle. (See tracings, Fig. 38.)

CASE XXVII.—E. McD., aged seven years. (Same patient as Case V.) Fracture of left humerus just above joint. Reduced; put up in splint at right angles.

Ten days. Slight lateral motion persists, but no crepitus.

Fourteen days. Considerable thickening just above joint, apparently callus. Position good; union firm; about one-third of the normal motion.

Twenty-two days. Good position; well marked callus, chiefly anterior. Flexion to 25° beyond a right angle; extension not over 10° .

Twenty-nine days. Flexion to 25° , extension 20° ; rotation two-thirds the normal range. Still a marked callus.

Thirty-six days. Flexion 30° , extension 20° ; a few adhesions broken up. Splint and sling omitted.

Forty-six days. Flexion 35° , extension 30° beyond a right angle.

Re-examined at fifteen months.—Left arm shows marked though not extreme gunstock deformity. Hyperextension possible to about 20° - 25° . Flexion very nearly normal. (See tracing.) A line palpable anteriorly on outer half of the shaft above the epiphyseal line, apparently callus, not the edge of either fragment. Pro- and supination normal. Arm perfectly normal in function. (For the tracings, see Fig. 14.)

CASE XXVIII.—D. D., aged seven years. Fell on elbow, fracturing it. Put up elsewhere in plaster-of-Paris bandage at a right angle.

Forty-four days. First seen by the writer. Much thickening

above the external condyle; internal condyle not readily felt, as the ulna (and the radius with it) displaced inward. Flexion one-fourth normal, extension to 40° beyond the right angle, pro- and supination one-third normal. Decided gunstock deformity. Splint at right angle.

Fifty-six days. Callus as at last note. Motion improved.

Sixty-one days. Flexion somewhat beyond the right angle. Pro- and supination almost normal. Splint omitted.

Seventy-seven days. Extension about 70° beyond right angle, flexion to right angle only, pro- and supination normal. Callus as before noted. Ulna still displaced. Treatment discontinued.

Re-examined at six and a half months.—Flexion to 20° beyond a right angle. Extension to full normal limit. Slight backward displacement of the lower fragment as a whole. Distinct gunstock deformity; a reversed angle of 15° .

CASE XXIX.—W., aged six years. Transverse fracture of lower portion of humerus above the elbow-joint, but well within the lower third. Put up at right angle.

Three days. Still mobile.

Twelve days. Still free hinge motion.

Twenty-days. Much callus. Union beginning.

Thirty-seven days. Apparatus omitted.

Forty days. All motions practically normal. Sling omitted.

Re-examined at fourteen months.—Function perfect. Motions perfect. Small callus still present. No deformity; tracing not taken.

To recur to the two alleged types—the extension and flexion types—there is in this short series no such distinction. Case XXI shows no obliquity at all anteroposteriorly; ³¹ Cases XIX and XXII and others do show it to some degree. From these few cases, from Kocher's own statements, from Mouchet's X-ray plates, etc., it is safe to say that the "extension" type, oblique upward and backward, is present in the majority of the cases. It is indeed an open question whether there is good evidence of the reverse obliquity in any single case.

Even where there is anterior displacement (Case XXIII,

and Poland's excision specimen, his Figs. 71, 72, and 73), there is no trace of this obliquity.

Obliquity down and out is occasionally seen; so in a sketch of an operated case by Payr.³²

The reverse obliquity, down and in, may occur. Cases XVII and XXII show this obliquity.

As to displacement, this seems to be almost universally a backward displacement of the lower fragment. Such few specimens as exist usually show this,³³ as do the published X-rays; but here, for once, the evidence of the great bulk of clinical reports resting on manual examination is the best available evidence. Evidently, anterior displacement, with or without obliquity of the fracture line up and forward, is, except as an "arte fact," a rarity. The only good clinical case the writer has seen reported is one of which Poland gives a skiagraph. Where anterior displacement does occur, it is accompanied by forward and upward rotation. Conversely, a backward and upward rotation is conspicuous and constant where uncorrected backward displacement exists. This rotation may be considerable in extent.

Outward and inward displacement are of secondary importance, not usual, rarely considerable. Rotation to either side in this plane hardly occurs except as a result of treatment; uncorrected, it is the cause of the gunstock deformity.

There is, however, a rotation of the lower fragment inward (or rather of the shaft outward) on a vertical axis which may be an important obstacle to proper reduction. This was present to a marked degree in Case XXII. It is obvious in the skiagraphs; and in a case figured by Leonard³⁴ the same condition seems to exist.

There may be, of course, no displacement at all, but a simple subperiosteal fracture, as in the supracondylar fracture in Case XX. (Fig. 39.) Kocher³⁵ describes such a case in a boy of sixteen years with obvious supracondylar fracture, but no displacement and very slight mobility. Case XXI of the writer's series is similar; here the periosteum was evidently largely untorn.

As to the mechanism of these fractures, Stimson found them occurring as the equivalent of epiphyseal separation in ab- and adduction; Kocher produced them by hyperextension, by flexion and forward thrust, by outward rotation of the arm, or by a blow on the hand with the elbow flexed and fixed. (So also in the writer's experiments.) Kocher thinks, however, that the injury probably results clinically from a fall on the elbow or on the hand; in the latter case rotation may play a part.

It is certain, from the cases recorded, that either a fall on the hand or on the flexed elbow *may* produce this form of fracture.

T- AND Y-FRACTURES.

No examples of this form of fracture are included in the writer's series. In two cases (XVI and XXIV) this diagnosis was made by the house-officer who first saw the case; but this diagnosis could not be confirmed from the X-ray or from the later clinical developments.¹ Evidently this fracture is rare in children. There seems to be but one anatomical specimen, that figured by Scudder,³⁶ a T-fracture following the epiphyseal lines almost exactly, with only partial separation.

Mouchet reports a case of T-fracture, confirmed by the X-ray and by a later operation, in a child of six years. Neither Kocher nor Poland give any cases in children.

All of the many specimens on which the description of this supposedly frequent fracture is based are from adults; of these every museum has several examples. The fact of the rarity of this fracture in children seems to have been generally ignored. The actual condition is well put by Deaver in a recent article,³⁷ where he writes, "It is interesting to observe that in all the radiographs of fractures about the elbow we have taken, but one of T-fracture has been met with. All the text-books upon surgery describe such a fracture, but do not speak of it as being rare. From our studies in this line of work we would say

¹ The writer has more recently seen two cases, diagnosed as T-fractures under ether by an unusually careful and competent man, shown by the skiagraphs to be supracondylar. The clinical diagnosis is not easy.

that this is not a very common fracture." Certainly this seems true as regards children; the fracture is not only not very common, but definitely rare.

FRACTURE OF THE INTERNAL CONDYLE.

(*So-called Internal Condyle into the Joint.*)

The writer has seen no case¹ in a child of fracture of the internal condyle in which the trochlear surface was involved. (This, and not the tearing of the capsule, which may occur with the *epicondylar* fracture, is evidently what is usually meant by "fracture into the joint.")

This fracture, apparently not uncommon in the adult, is evidently a rarity in the child. Mouchet, in 101 X-rays of elbow fractures, found no case of this fracture. There is but one specimen that shows this fracture of which the writer has any information. This is a specimen in the Warren Museum, No. 1025. It is a specimen from a girl of sixteen, in very poor preservation, but showing a fragment on the inner side which evidently included not only the epitrochlea, but a part of the trochlea as well.

Of clinical cases, Kocher³⁸ lists three. One of these, operated on after nine months, seems to offer a justified diagnosis; the patient was a girl of eleven. There were no X-rays in any of these cases, and of the remaining two, one is characterized by Kocher himself as doubtful, and the other leaves something to be desired in definiteness of diagnosis.

The skiagraph printed in Frazier's paper³⁹ as showing this form of fracture might be, so far as the printed plate shows, a supracondylar fracture with little displacement. This seems the more likely as there is an apparent displacement inward of the capitellar epiphysis which could not occur with internal condylar fracture alone. Wolff (*loc. cit.*) gives a drawing from a skiagraph of a case apparently showing this fracture.

Markoe,⁴⁰ in 1880, wrote a special paper on this form of

¹ Since this was written, the writer has seen one case, a fracture of the internal condyle (shown also by X-ray), with non-union after one year.

fracture. It was, however, based on but one case; and here again the data given are hardly sufficient to exclude the possibility of a supracondylar fracture or a fracture across at the level of the condyles.

Such series of cases as that of Fowler,⁴¹ for instance (external condyle, five; internal condyle, eleven; supracondylar, one; separation of the epiphysis, one; T-fracture, one), are hardly to be considered in the light of more recent and more perfect data. In such series it is obvious that there is a hopeless confusion of epitrochlear and internal condylar fractures, and the suggestion is inevitable that so small a proportion of supracondylar fracture might well be recruited from the list of those of the internal condyle. So, too, in a summary of a series which has just been published by Wilbert,⁴² the figures (external condyle, sixteen; internal condyle, nine, both condyles, *i.e.*, supracondylar, fifteen; T-fracture, one) are vitiated by the fact that no plates are given and no separation of the epitrochlear fractures is made.

FRACTURES OF THE INTERNAL EPICONDYLE.

These injuries are, as will appear, nearly always pure separations of the epitrochlear epiphysis, involving or not involving the joint cavity, largely according as they occur at an age when the epitrochlea is still a part of the general epiphyseal cap, or later, when it is in no direct relation to the other epiphyses or to the capsule. The severity of the trauma and the extent of displacement must also, of course, be important in determining the injury to the joint.

CASE XXX.—M. F., aged eleven years and eight months. Was thrown from a bicycle and fell with his arm twisted under him; it is not clear just how; was brought to the hospital immediately. There was a large hæmatoma without obvious excoriations on the *inner* side of the left elbow and considerable pain and disability. Examined under ether. In the midst of the hæmatoma a fragment was to be made out, freely movable, though evidently not entirely loose. This fragment seemed a little large for the

epitrochlear epiphysis, and on replacing it bony crepitus could be obtained. There was an unusual play in the direction of *abduction* with the elbow extended, but otherwise the joint seemed mechanically intact, and there was evidently no other fracture. The fragment could be replaced to much better advantage with the joint in flexion. Fracture reduced. The elbow was put up in acute flexion in a Lund swathe, with a pad and a thatched strapping of adhesive plaster to press the fragment backward into

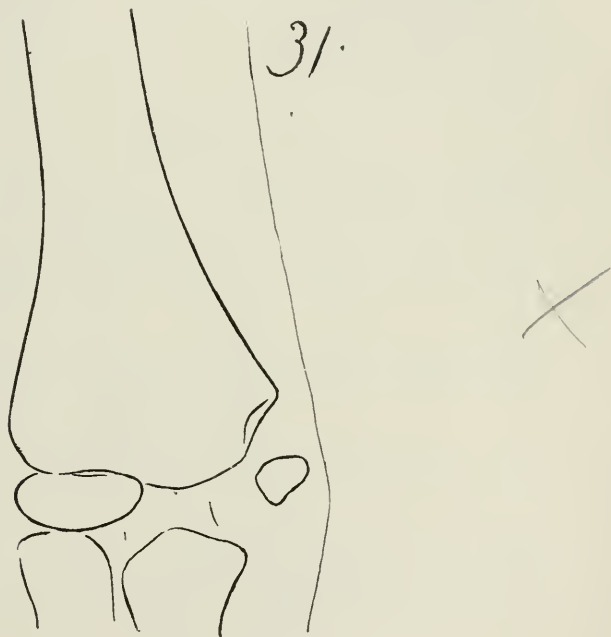


FIG. 39.—Case XXXI (X-ray tracing) (at three months).

place. The patient did not return to the hospital for subsequent treatment, but was looked up later at home.

Re-examined after four months.—Function perfect. Flexion and rotation normal. Extension limited about 10° . The fragment is displaced a little (perhaps one-sixth inch) downward and very slightly forward. It is hardly, if any, larger than the epiphysis alone would be, and is united to what remains of the epicondyle; union is firm but evidently not bony. On inspection, the deformity is only a lessened prominence of the normal spur of

the epitrochlea. There is *no* deviation of the forearm. Some atrophy of plexus of forearm. Tracing unnecessary.

CASE XXXI.—C. K., boy of eight years. Fell out of a hammock. Fracture put up on internal angular splint under ether. X-ray fails to show any fracture of the shaft.

Nineteen days. No pain; considerable motion.

Twenty-six days. Swelling nearly gone. Considerable thickening about the internal condyle. Position good.

Thirty-five days. Splint omitted. Bandage.

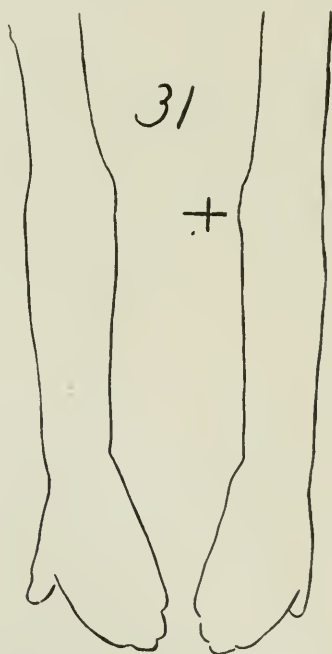


FIG. 40.—Tracings of Case XXXI (after sixteen months).

Forty days. Flexion to 35° beyond a right angle, extension a few degrees only. Pro- and supination nearly normal. Bandage omitted.

Forty-seven days. Extension 15° , flexion to 45° .

Fifty-four days. Extension 20° , flexion 45° .

Seventy days. Motion no better; to carry weights to stretch out the joint.

Three months. Extension only 40° . To have a fresh skia-

graph. Skiagraph shows only a separation of the internal epicondyle (epitrochlea) as an epiphysis. It is displaced downward to the level of the joint and rotated down and inward.

Five months. Flexion normal, but extension only 45° . Rotation normal.

Re-examined at sixteen months.—Function perfect. Flexion normal; pro- and supination normal. Extension normal within a very few degrees. The displaced epitrochlea forms a prominent mass (see tracing) somewhat larger than a normal epitrochlea; it is displaced downward and slightly forward; it is movable both on the humerus and on the forearm, but the firmer connections seem to be with the latter. No muscular disability, no atrophy.

CASE XXXII.—M. B., boy of about eleven years. Dislocation of the forearm and fracture of the internal epicondyle. Ether. Reduced and put up in acute flexion. X-ray showed a definite separation of the left epitrochlear epiphysis without implication of the diaphysis. The fragment displaced down and apparently inward.¹

Thirteen days. Almost no synovitis. Moderate muscular spasm. The epitrochlear fragment is loose and is displaced forward and downward. Lund swathe.

Sixteen days. Fragment less mobile.

Twenty days. Displacement of fragment is not great. Union not yet solid.

Twenty-seven days. Can be fully flexed and can be extended to a right angle. Fragment is displaced a little downward and about one-third inch forward; it is much less mobile. Internal angular splint at a right angle instead of the acute-flexion swathe.

Thirty-four days. Not yet solid. Flexion now only about 45° from a right angle. Extension to 40° beyond a right angle.

Forty-three days. Small fragment no longer mobile so far as can be palpated. To have massage.

Fifty-one days. Flexion normal in range; extension still not beyond 130° . Did not reappear. Could not be found later.

This injury was first described by Granger in 1818.⁴³ The injury is a not infrequent one, and the type of the separa-

¹ Negative definite, but did not print well.

tion and displacement is amply attested by museum specimens and by cases operated on. Owing to the fact that union is usually fibrous, even old cases and specimens are of value in determining the lesions.

A specimen from Zuckerkandl is described by Hamilton.⁴⁴

Gurlt figures a specimen in an adult, with apparently bony union; but here the fracture was apparently behind the epiphyseal line.

Poland records a specimen from the dissecting-room, and notes another specimen credited to Kammerer.

Of specimens examined as a result of operation for various causes may be cited those of Kocher⁴⁵ (three cases), Pauly,⁴⁶ Hutchinson⁴⁷ (two cases), Poland,⁴⁸ Debruyne, Wolff,⁴⁹ Denucé,⁵⁰ Payr.⁵¹

All of these were, to judge from the data given, pure or practically pure epiphyseal separations, and all showed fibrous union only; in fact, there seem to be no actually attested cases of bony union save the specimen of Gurlt, above referred to.⁵² Fibrous union is undoubtedly the rule.

As to the implication of the joint in these separations, Kocher's series of operated cases is interesting. Of three cases where this point was determined and definitely noted at operation, there was but one case where the joint capsule was torn open. This was in a child of seven years; the others, with the joint intact, were aged one fourteen or fifteen years, the other seventeen years. This is in exact accord with the anatomical fact that the capsule after the age of thirteen or thereabouts does not extend up as far as the epitrochlea.

It must not be forgotten, however, that this injury may accompany a dislocation of the elbow; then the joint capsule must be torn open. (See Case XXXII.)

As to displacement, this is in the great majority of recorded cases downward, usually downward and forward. So it was in the writer's three cases.

Hamilton reported a case with a downward displacement amounting to one and a quarter inches, and in Payr's case the

fragment was so far displaced as to lie on the front of the trochlea and seriously limit motion.

There are cases where the epiphysis is only loosened without displacement. Powers⁵³ reports such cases,⁵⁴ as does Mouchet; the writer has not recognized this lesion.

Upward displacement is recorded in cases by Hamilton, Fallier, and a case of Tröschel's is quoted by Poland.

Poland reports a case with some backward displacement of the fragment.

As to mechanism, the histories of recorded cases seem to show that the injury may be a result of (*a*) direct violence (see Case XXX); (*b*) muscular action; (*c*) as an equivalent of rupture of the internal lateral ligament (1) in luxation (see Case XXXII), (2) in abduction.

The causation by abduction is perhaps open to question, though Berthomier produced it experimentally on the cadaver.

The separation of this epiphysis is, judging by clinical reports, a not infrequent accompaniment of backward luxation. The ease of luxation, when this process has given way, is of interest in this connection. Kocher writes that he produced luxation in two cases that presented only the epitrochlear fracture on entrance; the luxations were produced accidentally while demonstrating the cases.

Of especial interest in regard to this lesion is the injury to the ulnar nerve which frequently results from it. As a rule, this nerve lesion is a primary one due to the trauma of the fracture, less usually due to callus. Cases are recorded by Granger⁵⁵ (three), Hamilton,⁵⁶ Jones,⁵⁷ Denucé, Richet, Wolff, Hutchinson, Jr.,⁵⁸ Kocher,⁵⁹ Payr,⁶⁰ and others. The last five writers report cases where excision of the fragment was done for relief of nerve symptoms. As a rule, the cases, with or without operation, have finally terminated favorably.

It is to be noted that injury to the ulnar nerve in elbow fractures is not confined to epitrochlear fractures. Payr⁶⁰ notes a second case resulting from a supracondyloid fracture;

Numm,⁶¹ a case resulting from separation of the whole lower epiphysis; Mouchet,⁶² a case of ulnar neuritis following a fracture of the external condyle.

Broca and Mouchet,⁶³ indeed, assert that supracondylar fractures are more frequently a cause of nerve injury at the elbow, in general, than the present or any other form.

Of interest, though as yet unexplained, is the atrophy not of the ulnar supply as such, but of the group of muscles arising from the epitrochlea. This is evidently a result of the fracture *per se*, and has nothing to do with any neuritis. It was noted by César⁶⁴ in three cases, also by Richet,⁶⁵ and was evident, though not considerable, in the writer's Case XXX.

FRACTURE OF THE TROCHLEA ALONE.

This fracture, included in some of the classifications, is introduced here only to dismiss it. The only instance of the supposed lesion seems to be a case by Laugier. The account of this case⁶⁶ seems to leave the diagnosis, even in this one instance, very doubtful indeed.

FRACTURE OF THE CAPITELLUM.

(*Fractura Capituli Humeri Partialis.*)

The writer has not met with this lesion. This fracture, first described by Hahn,⁶⁷ is a rare but well attested lesion. Hahn's specimen was from an adult,—a dissecting-room specimen; and of Kocher's⁶⁸ four cases three were at nineteen, nineteen, and seventeen years of age, respectively. The fourth case, however, was in a boy of fourteen. It was, like the rest, a separation of the articular surface of the capitellum, giving a free, or nearly free, body in the joint, palpable posteriorly, with the characteristic limitation of extension and supination without hinderance to other motions. This fragment in this, as in Kocher's other cases, was excised with a practically perfect result.

The only other case in a child is reported by Wright,⁶⁹ an identical lesion, found at an operation rendered necessary by suppuration immediately following the injury. The patient was a boy of twelve years.

FRACTURE OF THE EXTERNAL EPICONDYLE.

The writer has seen no case.

Gurlt ⁷⁰ figures such a fracture with bony union of the fragment.

Bardenhauer ⁷¹ reports two cases, one from a direct blow; a compound case.

Astley Cooper ⁷² figures a case where there was only fibrous union.

Kocher cites a doubtful clinical case.

Mouchet gives two skiagraphs of cases where this diagnosis was made. The X-rays are not quite clear, and the persistence of joint rigidity for some weeks suggests that the external condyle as well as the epicondyle may have been involved in these cases.

All of the definitely determined specimens are, it will be noted, from adults.

It seems that this lesion may at times accompany a backward luxation of the forearm; but up to date the only evidence to support this seems to be the fact that Fischer has so produced the fracture experimentally, and that cases have been reported by Magnan ⁷³ and Wolff, ⁷⁴ when this was apparently the lesion present.

OCCURRENCE.

These, then, are the lesions occurring in elbow fractures in children. Three classes serve to include all but exceptional cases.

To sum up as regards frequency of occurrence, the writer's series gives external condyle, sixteen; "bicondylar" fracture or epiphyseal separation, none; supracondylar, thirteen; epitrochlear, three.¹

This proportion agrees fairly with the results of the only other ² available series controlled by X-rays—Mouchet's. He

¹ Since writing this, the writer has verified the diagnosis satisfactorily in but eight cases,—four were supracondylar, three of the external condyle, one of the internal.

² Wilbert's series, as noted, lacks necessary details.

gives ⁷⁵ external condyle, thirty-nine; supracondylar, thirty-seven; epitrochlear, twenty-two.

Kocher, whose series was not controlled by X-rays, but is none the less very careful and includes a number of cases verified by operation, also puts the external condylar fractures in the first place,—fourteen cases as against twelve supracondylar, and six epitrochlear fractures.

Evidently these three forms of fracture are common, especially the supracondylar and that of the external condyle. The more careful lists show apparently that separations of the whole epiphysis are at least less common than has sometimes been asserted.

Fractures of the external epicondyle or of the capitellum are so rare, at least in children, as hardly to deserve notice.

As to T-fractures, they are evidently infrequent. There is no doubt that the lesion is a not uncommon one in adults; every museum has several specimens to show this. A series of cases recorded by Ray,⁷⁶ nearly all in adult railroad employees, shows ten T- or Y-fractures out of a total of seventy-eight.

Kocher, who gives no cases of this fracture in children, says, "In unseren Fällen die Erwachsenen vorwiegen; es bedarf hier keiner Disposition: die Aeusserer Gewalt ist maassgebend;" and Mouchet writes, "À la différence des autres fractures de l'extrémité inférieure de l'humerus celle-ci n'est point spéciale à l'enfance; elle s'observe plus souvent chez les adultes."

It is not necessary to agree with Kocher as to lack of "disposition;" probably the rigidity of the whole condylar portion of the humerus in the adult as contrasted with the elastic cartilage of the child, as well as the severer and often crushing trauma causing the adult injuries, will largely explain the difference. Unquestionably the T or V is essentially an adult's rather than a children's fracture.

As to fracture of the internal condyle, of which so much has been written, the writer finds himself again in accord with Kocher, who writes of this fracture,⁷⁷ "Merkwürdigerweise

ist in einzelnen Handbüchern angegeben, dass diese Verletzung eine häufige sei. Das ist aber unrichtig."

It is this text-book sanction that has given this form of fracture its apparent frequency. As a matter of fact, it is distinctly unusual, at least in children, and does not belong to any really practical classification. It is true that various series show an apparent frequency of this form of fracture; for instance, the series of Allis and of Fowler already cited, that of Powers⁷⁸ (twelve internal condylar and fifteen external condylar out of a total of fifty), or a recent article by Carleton⁷⁹ which assigns first place in point of frequency to this form. The writer can only reiterate that he believes such classification to be mistaken; in part it is no doubt a result of confusion (in word or in idea) between the epitrochlear and the supposed internal condylar fractures (so-called fractures of the internal condyle not involving, or involving, the joint); in part, doubtless, the result of the general geometric rather than pathological classifications of the text-books. Not only has the writer not met with this fracture, but he submits that the pathological data and the skiagraphs published to date sustain the contention that fractures of the internal condyle, including the trochlea, occur in children only as an exceptional lesion.

The injuries which make up nearly all the total fractures of the humerus at the elbow, the lesions each one of us may expect to find, are (*a*) of the external condyle; (*b*) supracondylar fractures (or total epiphyseal separation); (*c*) of the epitrochlear.

COURSE OF REPAIR.

If, then, we accept these as the lesions occurring, the first question is that of the course of repair and the recovery of motion. At the time of discharge from the surgeon's care these cases may be said to be discouraging in nearly all instances. There still remains a disability apparently out of proportion to the injury and to the reaction.

In the present series the results were tabulated to show

the time required to regain an arc of 90° of motion (that is about two-thirds the normal motion, for flexion is hardly over 45°). The notes of twenty-six of the cases gave data for this, and showed that this took, on the average, the surprisingly long time of fifty-three days. There was an extreme variation from case to case,—some gaining this point within two or three weeks, some gaining motion within a few days of the removal of the apparatus whenever that occurred, others (and these were cases which later regained full motion) showing a limitation of motion which persisted three months or more.

The most obvious important factor in relation to early recovery seems to be that of age. Of the twenty-six cases, in seventeen occurring after five years of age, the average time required to regain the 90° arc of motion was sixty-four days; the nine cases of five years and under required on an average but thirty-five days. This difference is sufficiently striking to offset the fact that the injuries in these younger cases usually involved somewhat less tearing and hæmorrhage about the joint.

As to the matter of mobilization, those cases (eleven in number) treated without massage or passive motion required an average of fifty-three days from the time of injury to regain the desired 90° motion; those in which massage was begun in the third or fourth week (three in number) required fifty-six days; those where it was deferred till later (twelve in all) required but forty-three days.

In watching the massage treatment as carried out on the present series, two facts were striking.

The first was the ease with which massage and even the gentlest passive motion may stir up joint rigidity instead of decreasing it. In the histories of Cases IV, X, and XXIV this is clearly seen. This was not a result of rough handling; forced passive motion was not used, and the manipulations were given by a skilful masseuse under the writer's supervision. It would certainly seem that massage so used is not, to say the least, very effective as a means of diminishing spasm

and rigidity; and the writer's general impression is that it is fully as likely to do harm as good before the fourth week at earliest.

The other point is that the muscular tension, here as in joint disease, is evidently the cause of limitation of motion, and is not a shortening of the muscle, but a simple muscular spasm. This is evident from the way in which the arm reacts when the angle of retention is changed. In the cases where acute flexion has been used, if we wait until the arm can readily be extended to a right angle and then apply an internal angular splint, we find in the course of the next few days not any considerable increase in range of motion, but a *shifting* of the arc of motion. Increased extension is possible, but is accompanied by a loss of flexion range. In other words, the muscles, though still retaining their spasm as before, have adapted their length to the fresh conditions. This change is to be traced in the histories of Cases I, XIV, XIX, and XXIV. It is fresh and definite evidence that the early rigidity is a question of muscular spasm, not of callus.

As to the rapidity of recovery according to the different lesions, the fractures of the external condyle required an average of forty-seven days to regain the 90° arc of motion, the supracondylar cases, fifty days.

All the cases of which the notes give data on this point recovered pro- and supination motion earlier than flexion and extension, and in no case was there any permanent limitation of pronation or of supination.

The interference with supination and its slow recovery, alleged by Mouchet⁸⁰ to be characteristic of external condylar fractures, has not been noted by the writer.

As to the rapidity of union according to the different lesions, it is of course unwise to be too curious about this point in examining elbow fractures; and the data show only that slow union was noted in three of the external condylar fractures (Cases IV, VI, and XVI),¹ in one supracondylar

¹ A like case of Mouchet's series (his Case XX) did not unite for over a month.

fracture (rather unusually high above the joint, Case XXIX), and in both the epitrochlear separations, of which notes are at hand.

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- ⁴⁷ British Medical Journal, 1892, i, 111; 1894, ii, 965.
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- ⁴⁹ Wolff: loc. cit.
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- ⁵² Sturrock, however (Edinburgh Hospital Reports, 1894, ii, 599), and others have reported cases where the union seemed, clinically, to be bony.
- ⁵³ Powers: New York Medical Record, 1888.
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(TO BE CONTINUED.)

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 23, 1901.

The President, B. FARQUHAR CURTIS, M.D., in the Chair.

CARCINOMA OF THE TONGUE.

DR. JOSEPH A. BLAKE presented a man, thirty-four years old, who was admitted to the Roosevelt Hospital on August 20 of the present year, suffering from an epithelioma of the tongue, of nine months' duration. The ulcer involved the left side of the tongue, extending from about an inch beyond the tip backward, and involving the anterior pillar of the fauces and the floor of the mouth to a moderate extent. The tongue was fixed. The lymphatics in both submaxillary regions were enlarged, forming visible masses which extended on the left side to within two inches of the clavicle and on the right side to the level of the thyroid.

On August 22, under nitrous oxide and ether anæsthesia, the lymphatics were removed from both sides of the neck, and the carotid vessels exposed. The division of the arteries was anomalous. On both sides the common carotids gave off the superior thyroids, linguals, and facials. These branches were divided between ligatures on both sides, and the external carotid was ligated on the right side. The left submaxillary wound was left open, the remaining portion of the incision being closed. One week later, with the same anæsthetic, the tongue, left half of the pharynx, and left tonsil were removed. The opening in the pharynx extended nearly to the median line posteriorly and down to the hyoid. The growth had extended farther than was supposed before the operation, and involved the left tonsil and both pillars of the fauces on the left side. A part of the right geniohyoglossus was left with the right epiglottidean fold to support

the epiglottis. The pharynx was packed with gauze through the external wound. It was interesting to note that during the operation the bleeding was limited to venous oozing. The pharynx was easily kept clear of blood and a tracheotomy was entirely unnecessary.

The patient was fed through a nasal tube. Convalescence was uneventful, excepting for the occurrence of an absorption temperature, which persisted for about two weeks. The pathologist reported that the growth was a typical epithelioma.

Eight weeks have elapsed since the operation. There is still an opening through the submaxillary wound which is rapidly contracting, and the pharynx has cicatrized in a most satisfactory manner. At the site of the remaining portion of the tongue there is a suspicious area which can readily be removed, if necessary.

Dr. Blake said he exhibited this patient chiefly as an illustration of what extensive operations could be performed about the throat and mouth, without preliminary tracheotomy, after ligation of the carotid branches supplying these parts.

CONGENITAL DISLOCATION OF THE HIP REDUCED BY OPERATION.

DR. CHARLES N. DOWD presented two cases as examples of the kind of improvement which may be expected after the changes in bones, ligaments, and other structures have progressed so far that there is no hope of development approaching the normal. In both cases it was fair to believe that the heads of the bones are permanently in the acetabula; both patients have been walking for several weeks, and the head of the bone has been in place in one case for a year and in the other case for more than four months. Treatment in both cases was interrupted by intercurrent illness and other conditions beyond control.

CASE I.—A little girl, four years old when she was admitted to St. Mary's Free Hospital for Children on July 11, 1900. Her parents were healthy. She had had no other illness of importance, and was supposed to be a normal child until she was nearly two years old, when her inability to walk well attracted attention. A month before her admission to the hospital her mother had first noticed the prominence of the abdomen due to lordosis.

Examination showed congenital dislocation of both hips, the

head of the bones being easily felt on the dorsum of the ilia, the great trochanters being about an inch and one-half above Nélaton's line. The movements of the thighs were abnormally free. On attempting to walk, she moved with great difficulty, and in a position of extreme lordosis. In other respects she seemed healthy.

On July 26 an effort was made to reduce the right hip, under ether, by the bloodless method of Lorenz. The head of the bone apparently slipped into the acetabulum. The leg was put up in plaster in a position of flexion, abduction, and internal rotation. Three months later the process was repeated, as the head of the femur was not in the acetabulum. This likewise proved ineffectual. A series of efforts was then made to stretch the shortened muscles and tendons so that an open operation could be done with a good prospect of success. These efforts were continued with as much regularity as was practical for several months, but had to be intermitted from time to time on account of intercurrent illness and the pain and discomfort which they caused. The apparatus which caused most discomfort was the two weights applied to each leg,—one drawing the leg downward and outward, somewhat after the manner of Buck's extension, the other drawing the head of the bone downward and inward by a band at the upper part of the thigh, the line of traction being at right angles with the first. The kind of traction which was borne best was a windlass traction, which was applied under ether and left on for several days, and then reapplied by a weight which drew the leg downward and outward.

An open operation was done on May 17, and the head of the bone was pulled as low as the acetabulum without much difficulty. The ordinary conditions were as follows: shallow acetabulum, small femoral head, short femoral neck, which was almost at right angles with the shaft and bent forward. The capsular ligament was in the shape of an elongated narrow tube which the head of the bone could not penetrate. This was freely opened, the acetabulum was gouged out with a good-sized curette and enlarged, the head of the bone was placed into it, and considerable tissue was cut from the upper portion of the capsule, which was then sewn together with chromicized gut. The wound was closed, and a strong plaster spica, reinforced by metal strips, was applied from the thorax to below the knee, the thigh being held

in a position of flexion, abduction, and internal rotation. This dressing was renewed from time to time until October 3, the child walking during the summer with the plaster in position, the leg being extended a little more with each change of dressing.

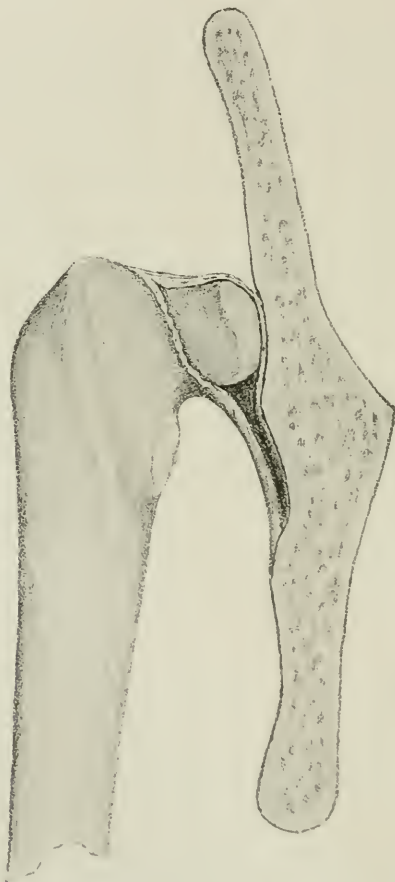
At the present time the head of the bone is in the acetabulum; the leg is slightly abducted and flexed, and has only a few degrees of motion.

P. S.—Under ether anæsthesia a few days later, the leg was easily adducted and extended and held in position by plaster. Motion was easily obtained, the head remaining firmly in the acetabulum.

CASE II.—This child was six years old when she was admitted to St. Mary's Hospital on September 26, 1900. Her parents were healthy. She had always enjoyed good health, excepting for a dislocated right hip, which had existed since birth. She had been under treatment for this condition at intervals during her entire life, the correct diagnosis having been made when she was about four years old. Her case was one of much severity, resulting in a shortening of two and one-quarter inches. The head of the femur could be felt above and behind the acetabulum. Motion was very free, and she walked with an exaggerated limp. After preliminary efforts to lengthen the leg, an open operation was done October 11, through a diagonal incision across the trochanter. The condition of the head of the bone, the acetabulum, and the capsular ligament are indicated in the accompanying diagram. (See Figure.) The head of the bone was inserted into the acetabulum with great difficulty after dividing the fascia of the adductors and gaining all which could be gained by forcible abduction and downward traction. The acetabulum was enlarged with a good-sized curette, and a small portion of the upper margin of the articular surface was pared from the head of the femur, partly to facilitate reduction, which was most difficult, and partly in the hope of obtaining ankylosis, as the parts were so much deformed that it would be difficult to maintain the reduction: the child would have been well off with one ankylosed hip in good position, since she had a normal hip-joint on the other side. She was put up in a position similar to that employed in the previous case and the plaster was removed after two months. There was then a shortening of one and one-quarter inches and much mobility of the head of the bone, so that it was deemed best

to keep her in bed with extension applied. This was continued for several weeks, variation being made in the extension from time to time.

On July 12 of the present year another incision was made to determine the conditions present and to endeavor to make the joint somewhat firmer. It was found that a hard ridge was pres-



Congenital dislocation of the hip (Dowd).

ent, which formed the upper margin of the acetabulum. The shrunken femoral head was below this in the acetabulum. The capsular ligament was still rather loose. The acetabulum was deepened still more with the curette, and the capsule shortened by excising a piece and sewing the margins together with chromi-

cized gut. The child was kept in plaster until October 1, but was allowed to walk in August. She now has one and one-quarter inches' shortening. The joint permits of free motion, and the bone slides up and down in its socket somewhat. She walks with a moderate limp, which is largely due to the shortening of the neck of the femur, which necessitates throwing the body to that side in walking in order to maintain the balance.

DR. ROYAL WHITMAN, after examining the patients shown by Dr. Dowd, said in regard to the second case that while the head of the femur might be in a cavity, it could hardly be in the acetabulum, because the trochanter was practically on the level of the anterior superior spine. In the first case there was considerable flexion deformity present, which in his opinion should be reduced before it became permanent.

Dr. Whitman said that in his earlier work in connection with the open operation for congenital dislocation of the hip he was misled by the German writers, who advised that the fixation apparatus should be removed in a few weeks to permit massage and passive motion. This the speaker regarded as a mistake. In these cases in which the acetabulum is enlarged, the joint should be supported until repair is complete, as indicated by the subsidence of local sensitiveness and of the tendency towards flexion. One of the more recent cases upon which he operated was fixed into plaster bandage for eight months continuously, and the result as regards motion was very satisfactory. Deformity following these operations is due to adhesions and to muscular retraction, and might necessitate correction from time to time under anæsthesia.

In reply to the query whether prolonged immobilization in these cases, especially after such an extensive operation as the one resorted to by Dr. Dowd, might not result in ankylosis or even bony union, Dr. Whitman said he was not afraid of ultimate ankylosis in a ball- and socket-joint like the hip if the cartilage is not removed from the head of the femur. The object to be sought for is a straight limb with a certain amount of motion. Ankylosis is not induced, but is prevented, by fixing the limb during the stage of repair as in hip-joint disease. By giving the joint a long rest, complete cicatrization will take place; then, if necessary, one can break up fibrous ankylosis. In the meantime the child is using the limb, which is held in normal position; whereas, in the

absence of support it will almost inevitably become deformed and practically ankylosed, as in the case presented.

DR. DOWD rejoined that he felt positive that in the second case shown the head of the femur was in the acetabulum, as he had the opportunity of examining it at the time of the second operation. There was a distinct acetabulum which was shallow and enlarged, and the head of the bone was in it. The capsular ligament encircled both the head of the bone and the acetabulum, and contained synovial fluid. The neck of the femur was short and depressed and the head small; the joint was not a firm one, owing to the deformity of the parts, but the head of the bone was in the acetabulum.

ACUTE DIFFUSE GONOCOCCUS PERITONITIS.

DR. DOWD presented a girl of seven years, who was admitted to St. Mary's Hospital for Children, April 22, 1901, with a purulent vaginal discharge, which had been noticed for a little more than a week previous to her admission. For a few days she had been complaining of pain in the lower right side of the abdomen. This pain was so severe that she would cry out when pressure was made in that area. She had marked rigidity of the abdominal muscles, and lay with her thighs flexed. Her temperature was 102° F.; pulse, 136. A bimanual examination was made with one finger in the rectum. The uterus was in its normal position and freely movable; no tumefaction could be distinguished about the tubes so far as they could be reached. The vaginal discharge contained gonococci. Operation was not permitted, and for two days there was slight improvement. The temperature dropped to 100° F.; pulse, 120, and the bowels were moved; but the pain and tenderness persisted and extended to the opposite side. There was much general tympanites, with pain and tenderness, and the child plainly showed the constitutional effect of the disease.

Three days after admission a median incision was made. The intestines were found to be much inflamed, bright red in color, with slight deposits of fibrin and a small quantity of free serum in the peritoneal cavity. The inflammation existed on both sides, but was more marked in the pelvis than in the upper parts of the abdomen. There was about half a drachm of pus at the outer extremity of the right Fallopian tube, the ovary forming part of the abscess wall. The right tube and ovary were removed. The

vermiform appendix and the left tube and ovary were not enlarged, but the peritoneum surrounding them was the seat of the same peculiar bright red inflammation which was evident elsewhere. The peritoneal cavity was irrigated with several quarts of normal saline solution at a temperature of 110° F., and the incision was closed. The patient made an uninterrupted recovery.

Smears were made from the pus in the abscess and from the exudate, and many gonococci were found which were decolorized by the Gram method. No other bacteria were found. Cultures were made from the peritoneal exudate and from the pus in the abscess in bouillon, agar-agar, gelatin, and blood serum, and they all remained sterile. Since the pyogenic organisms were not found either in the smears or in the cultures, we may believe that they were not present. The smears showed the gonococci to be present. The inflammation did not have the appearance or the clinical course of ordinary peritonitis, and was apparently the peculiar form of diffuse peritonitis which is due to the gonococcus.

It is only recently that diffuse gonococcus peritonitis has been proved to exist. This form of peritonitis is generally limited to a small area, as is shown in the local inflammations about the tubes and ovaries. The possibility of diffuse inflammation of this character has been strenuously denied. A few cases, however, have without question been observed. In 1899, Cushing, of Baltimore, reported two such cases, from one of which, by a happy incident, an abundant culture of the gonococcus was obtained. Usually the culture has not been obtained, because peculiar culture media are necessary which have not been available; but in this instance a large piece of fibrinous exudate was dropped into bouillon, which was thus modified so as to resemble Marmorek's human serum bouillon, which contains one-third human blood serum and two-thirds bouillon.

Both of Cushing's cases presented peculiarities similar to this case. The symptoms were less severe than would have been expected in peritonitis of such an extensive character. There was considerable pain, but no intestinal paralysis, and there had been no shock or collapse such as comes from perforation. The deep congestion of the peritoneum was referred to, and there was a deposit of fibrin, but practically no serum or pus. This case was in an early stage; there was hardly any fibrinous deposit and a very little turbid serum; but there was a peculiar bright red aspect

to the peritoneum, and the constitutional symptoms were mild in proportion to the extent of the inflammation.

Although the symptoms are usually mild, Muscatello (*Cent. Chir.*, 1900, p. 446) reports a fatal case in a woman of forty-eight, from whose peritoneal exudate a pure culture of gonococci was obtained on serum bouillon, and characteristic appearances were obtained on smears. Braquehay (*Cent. Chir.*, 1899, p. 874) reports a case of great severity in a child of four and one-half years, and Baginsky reports a fatal case, also in a child. In both of these cases, however, there is a possibility of an error in diagnosis, although hardly a probability.

STEREOSCOPIC RADIOGRAPHY.

DR. ALEXANDER B. JOHNSON presented a series of views demonstrating stereoscopic radiography.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, November 4. 1901.

The President, DE FOREST WILLARD, M.D., in the Chair.

INSTRUMENT FOR FACILITATING INTESTINAL ANASTOMOSIS.

DR. O. H. ALLIS made some critical remarks on the technique of intestinal anastomosis, and described an instrument for facilitating its performance. See March No. ANNALS OF SURGERY.

DR. CHALMERS DA COSTA said that he had used these instruments of Dr. Allis in general surgery but not in intestinal work, and had found them signally useful in operations, especially in hernia and for catching isolated blood-vessels and perforating vessels of the chest wall. He had used them with satisfaction in a goitre bleeding profusely from the surface of the gland. They are extremely useful in opening the peritoneal cavity, and for that purpose are to be preferred to the dissecting forceps.

DR. DE FOREST WILLARD said that in Connel's operation of intestinal anastomosis, leaving all the knots inside the lumen, all the coats of the bowel are sutured as in Dr. Allis's method, except that he makes a loop or rectangular stitch. To secure the final suture, when he comes to the last one he leaves the two ends untied; then inserts a fine threaded needle, eyed end first, from the opposite side of the gut between two of the stitches, catches the untied ends in the loop of thread, draws them out upon the opposite side by pulling up the lower wall of the bowel and flattening the cavity. The knot is then tied through the small opening between two stitches, the ends cut off, and the knot then allowed to escape back into the lumen of the gut. Every knot is thus left inside the lumen and will take care of itself. He has demonstrated both by experiment and by operations on the living subject that

suture of all the coats is perfectly safe and that there is no leakage. There is no infection as to the peritoneal cavity. The peritoneum will cover over the line of union in a few hours.

DR. RODMAN said that Dr. Allis had recognized the trend in favor of direct suturing in interstitial work, and his instrument simply facilitates this method. It provides one with more fingers, and enables one to do without assistants what possibly could not be done so well with them. Dr. Rodman had up to that time felt perfectly satisfied with the Murphy button. His results had always been good, and he had, therefore, not felt justified hitherto in giving it up, although theoretically there are objections to its use. It may not be ideal, but it is life-saving oftentimes. In using the button much depends upon the case, the size and shape of the button used, and, above all, one should be certain that it is manufactured by a reliable instrument maker. This is most important. He had known cases where the button was retained for several weeks, but in all of his patients it had promptly passed when the patient assumed the erect posture and began walking about.

DR. A. A. DAVIS asked whether the use of the through-and-through suture had been tested in a sufficient number of cases to demonstrate that there is no danger of leakage. The tendency to leakage in the bowel is quite marked in cases in which there is even such a small opening as a hypodermic syringe needle makes, the liquid contents of the bowel oozing through.

DISTAL LIGATION OF COMMON CAROTID AND RIGHT SUBCLAVIAN ARTERIES FOR ANEURISM.

DR. JOHN CHALMERS DA COSTA reported the case of a man, aged forty-five years, a blacksmith by occupation, who was admitted to the Jefferson Medical College Hospital December 4, 1899. When he was twenty-seven years of age he contracted syphilis, and was treated for it for a year or more. Seven years before his admission to the hospital, he began to have severe headache in the occipital region. The pain would come on without apparent cause, was of a sharp, boring character, and was aggravated by recumbency or by the use of the eyes in reading. He was given iodide of potassium, which relieved him; but whenever the drug was discontinued the pain would return. These attacks came on suddenly, in distinct paroxysms, and were not

accompanied by sick stomach. During each attack he was compelled to abandon work for two or three days. He took iodide of potassium, off and on, for about five years. The dose was then increased, and for three months he took 280 grains a day. After a time these large doses seemed to lose their effect, and the drug was discontinued.

During the seven months immediately preceding admission, he had taken no iodide of potassium whatever. During the antecedent two years the pain had become localized at a point two inches posterior to and a little above the mastoid process of the right side. It was not associated with tenderness, but at times became so violent that it was necessary to administer morphia to give him relief.

The eyes were examined by Dr. De Schweinitz, who reported as follows: "The eyes react normally to light, to accommodation, to convergence, and consensually. The media are clear and the fundus is normal. The nerve is of good color and the margins are distinct. The field of vision is normal, and there is no indication of a central nervous lesion."

The patient apparently had two varieties of pain. He has occasional attacks of undoubted neuralgia in the supraorbital and occipital regions, and also attacks of more deep-seated and persistent pain which, it may be, arise from some gummatous intracerebral condition. An examination of the patient showed that he had an aneurism of the right common carotid artery, in the root of the neck, and an aneurism of the innominate artery. The innominate aneurism caused very distinct bulging of the first and second costal cartilages, great pulsation, marked bruit, and distinct thrill. It seemed that the aneurism of the carotid was distinctly separated from the aneurism of the innominate artery. In view of this belief, it was determined to ligate the right carotid artery, the ligature being distal to the innominate aneurism and proximal to the carotid aneurism, and to also ligate the right subclavian artery, for the effect upon the innominate aneurism.

On the 13th of December, nine days after the patient's admission, he was operated upon before the class in the Jefferson Medical College Hospital by Dr. Da Costa, Professor Keen assisting in the operation. He first made an incision in the neck and explored the carotid artery. Through this incision he was able to outline the aneurism of the carotid and to feel the vessel between

that aneurism and the larger aneurism of the innominate. He found that the vessel was glued to its sheath by adhesions, and was undoubtedly diseased between the two aneurisms. He therefore decided that it would be inexpedient to apply a ligature between the aneurisms. The vessel was exposed just below the bifurcation, and a ligature was applied, which was distal to the carotid aneurism as well as to the innominate aneurism. This ligature was of chromicized catgut. After the common carotid artery had been ligated, the wound in the neck was closed, and an incision was made to expose the subclavian artery in the third part of its course, which was ligated with silk, after which the superficial wound was closed.

There was practically no shock from the operation. The temperature never went below normal. Immediately after the termination of the dressing of the case, the right arm was wrapped in cotton, and was kept warm with bottles of hot water for forty-eight hours. On the 16th of December (that is, at the end of the third day after the operation), the radial artery of the right arm was found to be pulsating. On the sixth day after the operation, the patient was given a hypodermatic injection of thirty-two cubic centimetres of Carnot's solution of gelatin, with the hope of aiding coagulation in the aneurismal sacs. It was noted at this time that the pulsation and thrill of the innominate aneurism were much less, and of the carotid aneurism distinctly less.

On the 10th of January the patient was allowed to sit up for part of the day; and on the 11th he sat up for most of the day. From this time on he improved, having occasional paroxysms of neuralgic pain in the head coming on at night; and he was placed on iodide of potassium, which seemed to give him relief. He was discharged from the hospital on the 18th day of January, a little over a month after the operation. At this time the aneurism of the innominate artery could be detected with difficulty. The very distinct bulging of the chest had passed away. There was still a perceptible murmur or bruit, but scarcely any thrill. The carotid aneurism was very much shrunken, and the pulsation felt far away.

For a time the man seemed to have been wonderfully benefited by the operation. Against advice he returned to his work as a blacksmith, an occupation in which he even shod horses. From

that time to this he has still gotten along very well, although he has recently noticed an increase of pulsation in the neck. On the 28th of October (1901) the patient again called at the Jefferson College Hospital, and was examined by Dr. Da Costa.

It was then obvious that he had disease of the carotid artery of each side, and that the circulation in the right carotid had been re-established. Throughout its entire extent the right carotid beat forcibly, and at one part, about the seat of ligation, was apparently aneurismal. The left carotid was dilated and pulsated forcibly. The re-establishment of the circulation may have been due to the early absorption of the ligature of chromic catgut. It is probable that the direct cause was the reckless return to violent labor. There was no bulging apparent at the seat of the innominate aneurism; and, comparing his present condition with that of two years ago, he was still wonderfully better, in spite of having labored at his most dangerous occupation.

The urine report of October 29, 1901, shows that fluid to be of a clear, amber color; acid reaction, and with a specific gravity of 1030, containing 1.9 per cent. of urea, a few leucocytes and epithelial cells, and a trace of albumen, but no casts.

The blood examination made October 31 shows erythrocytes, 5,462,000; leucocytes, 10,200; hæmoglobin, 78 per cent.; color index, 71 per cent. The differential count is as follows: Polymorphonuclear neutrophiles, 71 per cent.; small leucocytes, 14 per cent.; large leucocytes, 14 per cent.; eosinophiles, 1 per cent.

The eye examination, made by Dr. William Sweet, October 31, is as follows: "Media of both eyes, clear; pupillary reactions, normal; marked arterial and venous pulsation present in both eyes, but more marked in the left; no disease of either eye-ground."

The physical examination by Dr. Julius Salinger, November 7, is as follows: "The impulse of the heart is best seen in the midclavicular line, at the base of the sixth interspace, and is diffused to the ensiform cartilage, being quite forcible in the midclavicular line. There is marked pulsation of the vessels of the neck, especially of the right side. No thrill is perceptible in the mitral area, but just above the clavicle, on the right side, a coarse systolic thrill is manifest. There is no diastolic shock and no tracheal tugging. All over the precordium, a coarse, blowing, systolic murmur is perceptible, its area of maximum intensity

being over the aortic cartilage. The second aortic sound is scarcely perceptible, and the systolic murmur is transmitted to each carotid artery."

MISAPPLIED SUPPORT TO WEAK ANKLES OF CHILDREN.

DR. H. AUGUSTUS WILSON read a paper entitled, "Misapplied Support to Weak Ankles of Children," for which see March No. ANNALS OF SURGERY.

DR. G. G. DAVIS said that while the parents of children will direct their attention to the weak ankles, they will practically ignore the conditions which produce them; in other words, they will direct their attention to a local condition, and the general condition will be entirely ignored. Of course, weak ankles can come from various causes, but in young children it is often associated with rickets. Weak ankles are a single symptom. It may be the symptom which attracts most markedly the attention of the parents. They will then proceed to adopt one of those contrivances which are for sale in the dry goods and shoe stores, and which fail to correct the cause of that condition. If such a child is examined, it will be found not only to have weak ankles, but likely bow-legs, and show other evidences of rickets. The remedy is to be directed in an entirely different direction. It is to be directed to a strengthening of the parts rather than simple support. The object desired in these cases can be achieved in a different way. Oftentimes an ankle support is used to prevent abduction or adduction of the foot. That can be guarded against by raising, for instance, the inner or outer edge of the sole, and will not prevent the full use of the joint. He was personally not much afraid of restricting the motions of the joints. In small children, a brace on bow-legs is just as efficient with or without an ankle-joint, and he did not think that the foot or the lower limb would seriously suffer; but if one simply puts a support on an ankle-joint in a child whose general life is absolutely wrong, who is not living on the right food, then, of course, one fails to cure the case, and for that reason these appliances are most objectionable.

GASTROSTOMY.

DR. JOHN B. ROBERTS said that in August of this year he saw in consultation with Dr. Albert A. G. Starck a patient who had

fallen from a step-ladder and sustained a fracture of the femur. The man was in the neighborhood of sixty years of age and was treated by extension.

About two weeks later Dr. Starck asked him to see the patient again, saying that he had discovered some difficulty in the œsophagus, and that on inquiry he had found that the man had not been able to swallow properly for a number of years. On examination with a tube they found a stricture at the lower end of the œsophagus; and it became evident that the patient for months had been half starved because of the interference with deglutition. The condition was so bad that two days later he did a gastrostomy. The patient was so prostrated that operation under local anæsthesia was done. About half an hour before the time of operation the man was given a hypodermic injection of codeine sulphate, one grain, hyoscine hydrobromate, one-fiftieth of a grain, and strychnine sulphate, one-sixtieth of a grain. He had seemed a little drowsy before this injection, and promptly went to sleep while they were preparing for operation. He was asleep at the time the incision was made, though the skin was frozen with ethyl chloride. A two-inch incision was made parallel to the left costal border, about half an inch from that border and beginning nearly an inch and a half below the tip of the ensiform cartilage. The rectus muscle was split at the left side of the wound, and two ropes were made of its fibres; these were crossed. The operator drew a portion of the stomach out of the peritoneal cavity and slipped it through the space made by these displaced and crossed muscular fibres. A tunnel was made through the subcutaneous tissues, and the end of the projecting part of the stomach was brought out of a second incision which had been made, after freezing the skin, close to the costal border. After the sutures had been applied, the stomach was opened and a large rubber tube introduced.

Two or three times during the progress of these manipulations the patient moved as if he felt some pain. He was then given a few whiffs of chloroform. The amount given, however, was so small that it could have had very little effect; for the towel upon which the chloroform was poured was held to his face for only a minute or so. When the skin sutures were applied at the end of the operation, he flinched a little; but otherwise he was quiet, except for the motions mentioned above. He slept a long time after the operation.

A few days later some suppuration was noticed in the wound. It was probably due to a slight amount of leakage alongside of the tube. The small amount of pus was evacuated by taking out sutures, and the wound then did well. The recovery from the operation was prompt, and the man was fed with liquid food. He died sixteen days after operation from debility. This was probably due to the chronically starved condition from which he suffered, and the added depressing effect of the fracture of the femur and of two small bed-sores which had formed, despite the greatest care on the part of the family and nurses. No autopsy was obtained.

The case is reported merely to put on record the ease with which the operation was done under local anæsthesia and the comparative innocuousness of aseptic gastrostomy. The operation, of course, should have been done at an earlier period; but the patient had not been under the care of Dr. Starck until he received the injury by which the femur was broken.

The opening made into the stomach permitted during the latter part of his illness some leakage of the fluid introduced. It is probable that if he could have assumed the erect posture, the stomach would have held the food satisfactorily. The fixing of a portion of the stomach in the subcutaneous tunnel and the construction of the artificial sphincter by crossing the two portions of rectus muscle would probably have been sufficient to keep the gastric orifice closed around the tube used for feeding.

TRANSACTIONS OF THE CHICAGO SURGICAL SOCIETY.

Stated Meeting, November 1, 1901.

The President, CHRISTIAN FENGER, M.D., in the Chair.

TUBERCULOSIS OF BONE.

DR. BAYARD HOLMES presented specimens and the histories of three cases of primary *évidement* of tubercular bone foci. The first case was that of a woman, twenty-two years old, and in apparently perfect health, who had a slowly growing pain in the left knee, which was believed to be due to two tubercular foci,—one in the median or inner condyle of the femur, and the other immediately below it in the tibia. These foci were approached by an incision in the skin outside, that is, above the capsule of the joint, in the case of the femur, and below in the case of the tibia. The supposed location of the focus was then cut out with the gouge and sharp spoon, the focus removed, and the cavity filled with sterile iodoform crystals. The skin wound was drained for a short time, and recovery was perfect. In this, as in the other cases, there were enlarged lymph glands in the groin on the corresponding side.

The second case was that of a girl, eighteen years old, who had suffered from a swelled right knee, which came on slowly and had compelled her to go about for four years in a wheel-chair. In the spring of 1892 she was suffering more than usual, being kept awake at night, and frequently lost appetite and strength. After a year of observation and immobilization, during which many examinations of the joint were made, an operation was undertaken to remove the three foci, two in the femur and one in the tibia, which were believed to be the cause of the gonitis. Under chloroform anæsthesia the knee-joint was first opened and found free from tubercular disease. It was closed and the foci in

the bones, one after the other, were approached in the same manner as described in the previous case. The foci were easily recognized and removed, and the cavities filled with sterile iodoform and drained externally for a few days with iodoform gauze. The recovery was complete, the patient regained use of her knee, the limitation of motion was slight, she has been able to take long walks, and has had no return of the disease.

In the third case the diagnosis of an osteal focus in the outer lateral condyle of the femur was made six years before operation. Climatic treatment was recommended. When pregnancy occurred, there was an exacerbation of the disease. An X-ray picture showed the focus in the same locality as the diagrams of many previous observations. The pain and swelling were considerable, and an operation was undertaken in the same manner as in the previous cases. The patient made a prompt recovery, and the pregnancy was undisturbed.

In all these cases careful examination of the sequestrum was made, and in every case the tubercular character of the focus was demonstrated.

EXOPHTHALMIC GOITRE.

DR. HOLMES reported a case in which sudden death occurred after enucleation of the thyroid for exophthalmic goitre. The salient features in this case were a childhood without significant history or event; three years of married life; sudden onset of exophthalmic goitre resembling an attack of grippe, with vomiting. Apparent symptoms of pregnancy for three months; gradual loss of strength for six months. Operation under chloroform anæsthesia; enucleation of both lateral glands; closure of the wound; sudden death after twelve hours from cyanosis. No post-mortem examination was made.

EXTRAPERITONEAL RUPTURE OF BLADDER, WITH FRACTURE OF THE PELVIS.

DR. D. N. EISENDRATH exhibited a boy, five and a half years of age, who was run over December 4, 1900, by a street-car. The car-wheel had passed directly across the pelvis. The boy was brought to the office of Dr. George Laben, who dressed an extensive wound on the outer side of the thigh, exposing the muscles on the outer side of the thigh. The next morning it was noticed that the child had passed no urine since the accident. Dr. Good-

kind was called in consultation the evening of the day following the accident. He catheterized the patient, and obtained a tablespoonful of bloody urine. From the presence of dulness extending from the umbilicus to the pubis, and the bloody condition of the urine, a diagnosis was made of ruptured bladder, and operation advised. Dr. Eisendrath saw the child for the first time in consultation about twenty-six hours after the injury. Patient's pulse was 132, small and regular; the abdomen was tympanitic; liver was pushed upward; there was tenderness from the umbilicus downward, and from this point (umbilicus) to the anterior superior spine of the ilium a line could be distinctly drawn on both sides of the median line, below which there was complete dulness. Over the outer aspect of the right thigh was an extensive lacerated wound three inches in diameter, extending down to the deep fascia. He inserted a No. 5 catheter and obtained about two and a half ounces of bloody fluid. He injected four ounces of boric acid solution through the catheter and obtained a return flow of the same quantity, but deeply blood-stained. No crepitus was to be felt in any of the pelvic bones.

A suprapubic incision two and a half inches long in the median line was made; the prevesical space was found filled with bloody fluid; the peritonéum had been pushed up to the level of the umbilicus, so that the whole pelvis and subperitoneal tissue were filled with bloody urine. A finger inserted behind the symphysis pubis disclosed a separation of the two pubic bones, the right projecting backward and the left displaced somewhat downward. The bladder was partially full, and showed directly opposite the projecting pubic bone a small punctured wound which led obliquely through the coats of the bladder, similar to the manner in which the ureter passes through the normal bladder coats, so that the opening acted as a valve, allowing urine to escape only drop by drop. This opening was situated on the anterior wall just above the internal orifice of the urethra. In addition to this injury to the bladder, the urethra was found to be torn loose from its pubic attachment, so that the bladder was practically floating in the pelvis. The bladder was brought into the abdominal wound, anchored by two temporary silk sutures, and opened between these. The punctured wound was then sutured with three catgut sutures, passed through all the layers of the bladder wall except the mucosa. The edges of the bladder wound which he had made

between the two sutures, and which were situated in the median line near the fundus of the bladder, were brought up into the edges of the wound and sutured there as in a suprapubic cystotomy. In order to remedy the injury to the urethra, it was necessary to perform a perineal section; the urethra was found entirely severed at the bulbomembranous junction, and, owing to the fact that it would have required a long period of time to have found the proximal end of the urethra, retrograde catheterization was made and the proximal end thus easily found. A catheter was introduced in the external meatus along the pendulous portion of the urethra to the point of rupture, and then into the proximal portion, which had been found, as stated above, and left *in situ*. The perineal wound was packed, the packing being held in place by sutures. During the first forty-eight hours following the operation, the boy's condition was critical, and it was necessary to resort to four subcutaneous salt transfusions. The suprapubic wound gradually healed without any disturbance; the iodoform gauze drains that had been placed around the wound in the bladder in order to drain the pelvis were removed after the third or fourth dressing; but the healing of the urethral wound gave rise to a great amount of annoyance. Owing to the age of the child, it was almost impossible, after the removal of the catheter, which had been left in the urethra for three weeks, to pass any sounds in order to keep the channel clear. Every attempt was violently resisted, and, finally, a second anæsthesia was required to discover the cause of the trouble. It was found that, owing to the separation of the pubic bones, the normal curve of the urethra had been changed, so that the pendulous portion was at right angles to the remainder of the urethra instead of forming a gradual curve.

REVIEWS OF BOOKS.

PRACTICAL SURGERY. By NICHOLAS SENN, M.D. Large 8vo, pp. 1133. Philadelphia: W. B. Saunders & Co., 1901.

The author proposed to limit himself in this volume to a discussion of those subjects, only, that "come within the legitimate sphere of the daily routine work of every practising physician" (Preface). But in turning its pages the reader will find many things treated of at length that can come rarely within the range of the work of even the surgical specialist, while there are many things that frequently call for the care of the general practitioner that are omitted. This statement is not intended as an unfavorable criticism in any way, but merely as a premise to the additional statement that in this book the author has rather embodied those things which have most engaged his own attention, and to our knowledge of which he has himself added much.

Dr. Senn is still full of his experiences as a military surgeon during the late Hispano-Cuban campaign, and hence, starting on the basis of emergency surgery, he quickly advances to a graphic discussion of the peculiarities of military surgery. This is interesting, but more in the way of reminiscence than as a subject belonging to the daily routine work of practitioners in general.

Shock, Anæsthesia, Hæmastasis, and the Treatment of Wounds naturally present themselves as of prime importance for consideration, and are each most ably handled. It is interesting to note, as an example of the changes that a brief period may bring about in surgical practice, that in this, the latest of the surgical hand-books from the press, there is still no mention of analgesia by intrarhachidian cocaine injections, a method which for more than a year has commanded the attention of surgeons, and has

proven to be of great value. In the paragraphs devoted to styptics, we wonder, also, to find no reference to the use of suprarenal extract. In the description of the processes of repair after the ligation of blood-vessels the author is at his best, and this section is especially full and valuable. In the introductory paragraph of the Chapter on Wounds the author nods most conspicuously when he ascribes to the modern Dupuytren the oft-quoted words of Master Ambroise Paré, "*Je le pausay, Dieu le guérit!*" This chapter on wounds gives clearly and fully present knowledge with reference to wound-infection, and the methods of preventing and combating it. Eighty-five pages are devoted to the consideration of gunshot wounds. Here are detailed many of the cases personally observed by the author in the Cuban campaign.

Chapter viii is a very brief consideration of Ruptures of the Urethra. These seven pages, and about as many on Catheterization in Chapter xiv, are all that the book contains on any subject pertaining to the Genito-Urinary system. This omission is most notable, since in the surgical work of general practitioners such affections play a very large part. The commoner affections, as Cystitis, Urethritis, Urethral Stricture, Varicocele, Hydrocele, might well have engaged the attention of the author, in order that the modern methods of the management of such cases might be emphasized.

One hundred and sixty pages are devoted to fractures. By far the largest part of this section is occupied by a discussion of fractures in general. In these pages the learning, research, and pathological acumen of the author are everywhere apparent. Fractures of the Neck of the Femur and Fractures of the Lower Extremity of the Radius, and Fractures of the Skull are the only special fractures that are treated. Chapters on Dislocations, Exploratory Punctures, Operations on the Air-Passages, Empyema of the Thorax are followed by chapters on such abdominal conditions as Peritonitis and Appendicitis, both of which subjects

are treated ably and exhaustively. Altogether admirable, also, are the chapters on Intestinal Obstruction and the operations required for its relief. These constitute without question the most important portion of this book. Some general considerations pertaining to the subjects of Resections and Amputations conclude the work.

The book betrays the personality of the author on every page. It is of value not only as presenting comprehensively the most advanced teachings of modern surgery in the subjects which it takes up, but also as a record of the matured opinions and practice of an accomplished and experienced surgeon.

LEWIS S. PILCHER.

TRANSACTIONS OF THE SOUTHERN SURGICAL AND GYNÆCOLOGICAL ASSOCIATION. Vol. xiii. Thirteenth Session. Published by the Association, 1901.

This volume contains the transactions of the last meeting of this Association, held at Atlanta, Georgia, in November, 1900, and does the Association and the editors the same great credit which its preceding volumes have done,—from the scholarly address of the president, Dr. Cartledge, to the very index. This address of the president is a plea for the better appreciation of the limitations of surgical operative work, and may be read by all surgeons with profit.

A paper by Dr. Rodman with its discussion gives a judicious analysis of the subject of subarachnoid anæsthetization. The whole trend of the argument is not strongly in favor of the method. Dr. Kelly has an admirable paper on the removal of pelvic inflammatory masses by the abdominal route after bisection of the uterus, illustrated by Broedel and Becker's surpassing pictures.

Among other excellent papers which may be mentioned are those on appendicitis in the male and female by Dr. McRae, drainage in abdominal surgery by Dr. Long, and recent technical im-

provements in the surgery of the stomach for carcinoma by Dr. Macdonald. In the latter paper the author says, "Some two years ago I commenced employing von Hacker's method of attaching the jejunum to the posterior gastric wall with a re-anastomosis between the duodenum and the jejunum. The results of this method of operation have been most satisfactory. During the past year I have employed it eight times, with seven recoveries."

A paper on auto-intoxication from renal insufficiency, with and without diseased kidneys, by Dr. Jelks contains some valuable thoughts. It is particularly good because it calls the attention of the surgeon, and especially the gynæcologist, to the whole woman, and advises him, in seeking for the cause of her symptoms, to look away from the pelvis. He also says, "In recent years gynæcologist is another name for surgeon, and rightly so."

Dr. Kelly also has a paper on a rapid and simple operation for gall-stones found by exploring the abdomen in the course of a lower abdominal operation. One of the most complete papers is that by Dr. Parham on the operative treatment of hypospadias and epispadias. This paper gives an analysis of the various and approved operations for the relief of these diseases. Dr. Murphy has a carefully prepared article on the resection of the rectum through the vagina.

The most striking feature of this volume is Dr. Seneca D. Powell's address on carbolic acid in surgery. Dr. Powell is winning the sympathy of the surgical world in his efforts to place carbolic acid in the light of its great value before his professional colleagues. He says, "It has been my good fortune to discover a means of rendering its use in any strength comparatively free from danger, and to place before the profession a weapon against diseases heretofore almost incurable." After discovering that alcohol had absolute antidotal powers over carbolic acid, he began to apply it in surgery. He assails those who have attempted to deprive him of the honor of priority. If he is not overly sanguine, we have in carbolic an agent of vast utility. He takes the

position that, inasmuch as all infective diseases are dependent upon pathogenic organisms, and pure carbolic acid is an infallible germicide, and alcohol is a perfect antidote for carbolic acid, then we have three propositions which, followed to their natural conclusion, lead to the position that carbolic acid properly used is a remedy for all infective diseases.

Dr. Powell says that specific urethritis will yield to one treatment in the majority of cases. In the female he uses a drachm to the ounce, having thoroughly cleansed the vagina, following the use of the acid with alcohol after the surface is well whitened and puckered. He has usually been able to effect a cure in the male by a deep urethral injection of a 5 per cent. solution.

His most wonderful results have been in the treatment of erysipelas. He places the patient flat on the back and applies a 95 per cent. solution of carbolic acid with a mop of cotton. He watches the surface carefully, and as soon as it turns white swabs it off with alcohol. He has applied carbolic in this way to the entire body from the nipple line to the knees, and reduced a temperature of 106° F. to normal in four hours. He has applied this treatment to every form of surgical infection with wonderful success. Septic endometritis; tuberculous cavities in joints, bones, and lungs; brain abscess; empyema, are some of the conditions which he has found amenable to the carbolic treatment. He is able to cure ischiorectal abscess without laying it open into the bowel. Certainly Dr. Powell is a master of the technique in the use of carbolic acid, his method having been declared by Professor William H. Thompson as "the greatest discovery of the century." In closing his paper he makes an eloquent plea for an unprejudiced trial of his methods, and displays an earnestness which could only be founded upon deep conviction of the correctness of his claims. In the discussion of the question, the author of the paper shows a superior familiarity with the subject, and some of the disputants come tardily off.

JAMES P. WARASSE.

THE AMERICAN ILLUSTRATED MEDICAL DICTIONARY. By W. A. NEWMAN DORLAND, A.M. Second Edition, Revised. Large 8vo, 800 pages. Philadelphia: W. B. Saunders & Co., 1901.

The first edition of this work was issued in October, 1900. The special feature of the book was the convenience of the size, imitating, as it does, the flexible covered reference Bibles of the period, having the same thin, tough paper, large page, and flexible leather binding.

In this edition the book has been carefully revised. The author has also added upward of one hundred important new terms that have appeared in medical literature during the past few months. Among them appear "Anopheles," "Cryoscopy," "Johimbin," "Hemolysin," "Hedonal," "Sacrectomy," etc., words that have recently come prominently before the profession.

Other valuable features of the book are to be found in the complete and satisfactory definitions, the etymological references in the original languages, and the clear method of indicating the pronunciation. There are over one hundred new tables, and the illustrations add greatly to the usefulness of the book.

LEWIS S. PILCHER.

SUTURE OF THE ABDOMINAL WALL.¹

By CHARLES DAVISON, M.D.,

OF CHICAGO,

PROFESSOR OF SURGERY, CHICAGO CLINICAL SCHOOL; ADJUNCT PROFESSOR OF
CLINICAL SURGERY, COLLEGE OF PHYSICIANS AND SURGEONS, MEDICAL
COLLEGE OF THE UNIVERSITY OF ILLINOIS; ATTENDING SUR-
GEON TO COOK COUNTY HOSPITAL AND THE WEST
SIDE HOSPITAL.

IN suture of the abdominal wall after laparotomy, the ideal method of approximation is that of layer to layer apposition, uniting peritoneum to peritoneum, fascia to fascia, and skin to skin by independent planes of suture.

The ideal suture material is one that can be rendered sterile by boiling in water that will remain sterile while in the tissues, and that will cease to exist in the tissues when healing is complete and its function has been accomplished.

These indications are not fulfilled by absorbable sutures, of which catgut is the type, for the reason that this material is of animal origin, already infected with germs, the sterilization of which is difficult and uncertain, and cannot be accomplished by prolonged boiling in water without disintegration of the suture.

Absorbable sutures eventually break down and pulpify, liberating any imprisoned germs and making a line of culture material, a nidus for pyogenic germs, either local in the catgut or brought to it by the blood current. Many times late infection of a wound after primary union has occurred is due to this action of catgut.

¹ Read before the Mississippi Valley Medical Association, September 13, 1901.

Permanent buried sutures, the type of which is the twisted silver wire, are not the ideal sutures.

After healing has occurred and their function has ceased, they become foreign bodies, and either are encysted in the tissues or are surrounded by granulation tissue, and are gradually extruded from the tissues months or years after the operation.

I wish to present the method of closure of abdominal sections that I am using in routine work.

The wounds are closed by suturing each layer with a continuous silkworm-gut suture, the ends of which are left out at the angles of the wound to be removed by traction when healing is complete.

The suture in the strongest layer is tied in position at each end in the layer with knots that can be unlocked by traction on the exposed ends when the stitch is to be removed.

The closure of the peritoneum in a median laparotomy is illustrated by Fig. 1. The edges of the peritoneum are caught with forceps and held up away from the intestines by an assistant, and the peritoneum is closed by a continuous herring-bone suture of silkworm gut.

When the opening in the peritoneum is closed, the suture is shirred to take up all of the slack and to lessen the length of the wound, and the ends are left hanging out of the angles of the wound.

The silkworm gut is kinked in such a manner that it binds itself in the peritoneum and does not slip or pull apart; but by the end of a week, when the suture is removed, the elasticity of the silkworm gut has made the suture perfectly straight, and has brought the perforations in the peritoneum into a straight line, making a track around the stitch by pressure necrosis, so that it is very easy to remove by traction.

In removing this suture, the patient relaxes the abdominal wall by elevation of the thighs and shoulders; one end of the stitch is cut short, the other end is grasped in an artery-forceps protected by a bit of gauze and wound up close to the skin, and traction is made on the forceps like the handle to a corkscrew.

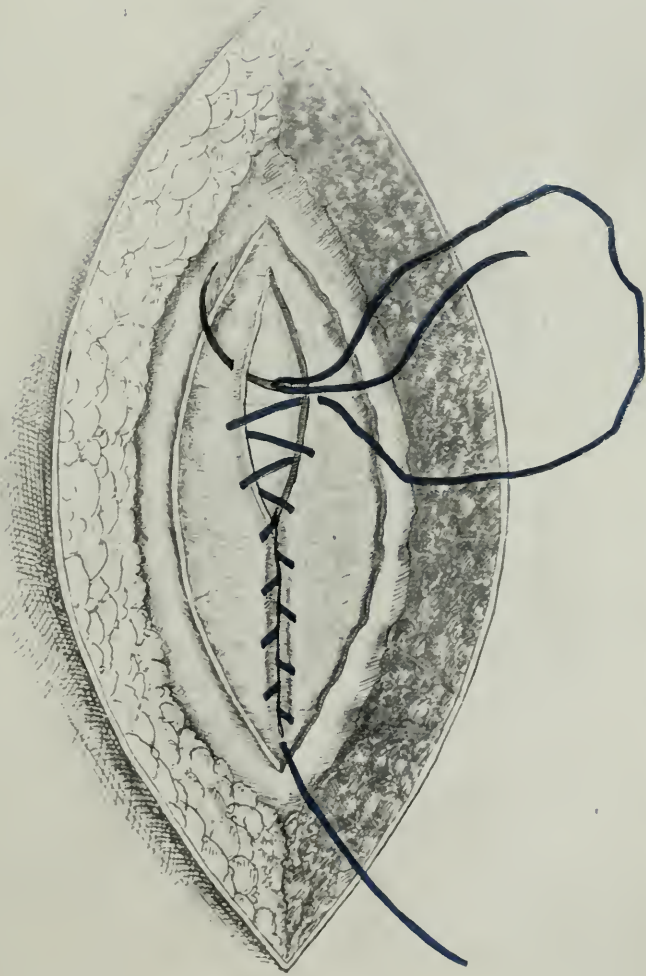


FIG. 1.—Suture of peritoneum.



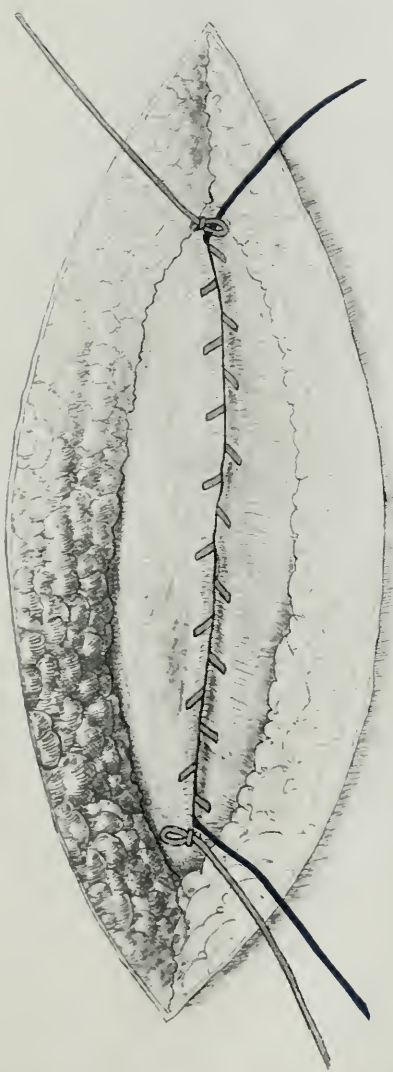


FIG. 2.—Suture of linea alba, tied in position.





FIG. 3.—Diagram of knot.





FIG. 4.—Suture of the superficial layer.



FIG. 5.—Suture of the sac.



For identification at removal, this suture may be colored black with silver nitrate, blue with an alcoholic solution of methylene blue, or the ends knotted to correspond.

The closure of the lineal alba in a median laparotomy is illustrated by Fig. 2. This is the strong layer of the abdominal wall, and if the tissues are fastened securely there can be no spreading of the wound. For this suture coarse selected Spanish silkworm gut thirteen inches long without flaw or defect is used.

A small reverse bow-knot (a diagram of which tied and loose is shown in Fig. 3) is tied four or five inches from the end of the strand. The edges of the fascia are caught with forceps and held up by an assistant. The suture is introduced in a firm place in the fascia back from the edge of wound and drawn tightly up to the knot, and the wound is closed by the continuous herring-bone suture. At the last stitch the suture is shirred up tightly, grasped by a smooth pointed dissecting forceps at its exit from the fascia, and another reverse bow-knot tied below the point of the forceps. With practice this can be done without a particle of slack being left in the suture. It can be tied in this manner as closely as in the ordinary method of tying a continuous suture. This layer being securely fastened takes all of the tension from the other layers. The ends are allowed to hang out at the angles of the wound. This suture is removed in two or more weeks. Simultaneous traction on the free ends unties the knots, when the suture is removed in the same manner as the peritoneal suture.

The skin is closed by the Halstead subcuticular stitch (Fig. 4) of silkworm gut colored red for identification by alcoholic solution of carbol-fuchsin.

These sutures act as capillary drains from each layer. If there are bleeding points which pressure or torsion do not control, they may be constricted by loops of the nearest suture without making a knot.

This method of suture can be used in appendectomy or any laparotomy in which there is no provision for drainage and in which the incision is in a straight line.

The same method of suture can be applied to any of the standard operations for the radical cure of inguinal hernia.

The sac is closed by a continuous mattress suture (Fig. 5) of silkworm gut, the ends shirred up, making a sort of double purse-string suture. The lower end is marked by a knot for identification, and the ends are tied together and brought out of the upper angle of the wound. This suture is removed at the end of a week by pulling up the lower strand and cutting it short, and then drawing out the upper fragment.

In the operation for hernia in which Poupart's ligament is imbricated over the conjoined tendon behind the cord, which I usually do, a simple continuous basting stitch (Fig. 6) tied at either end is used. The suture with the knot tied at one end is passed through Poupart's ligament about one centimetre from its free edge, close to the cord, penetrating the ligament from the outside and emerging from its internal surface.

The suture is next carried across the wound behind the cord and penetrates the conjoined tendon at the same level and distance from its edge, emerging on the peritoneal side of the conjoined tendon. The suture is then returned through the same tissues in the opposite direction, one centimetre below the first perforation, completing one unit of the continuous basting or sailor-stitch, which, when completed, is tied in position with the knot shown in detail in Fig. 3, and the free ends are allowed to extend out at the angles of the wound. (Fig. 7.) This is the strong layer, and when sutured firmly takes the tension from the other layers.

The fascia of the external oblique muscle is sutured to the shelving edge of Poupart's ligament over the cord with a continuous herring-bone stitch (Fig. 8) of black or blue silkworm gut, the ends projecting from the angles of the wound without being tied.

The skin layer is closed by the subcuticular suture of red silkworm gut already described. (Fig. 4.)

The suturing of Poupart's ligament to the conjoined tendon by edge to edge apposition, as in the typical Bassini opera-

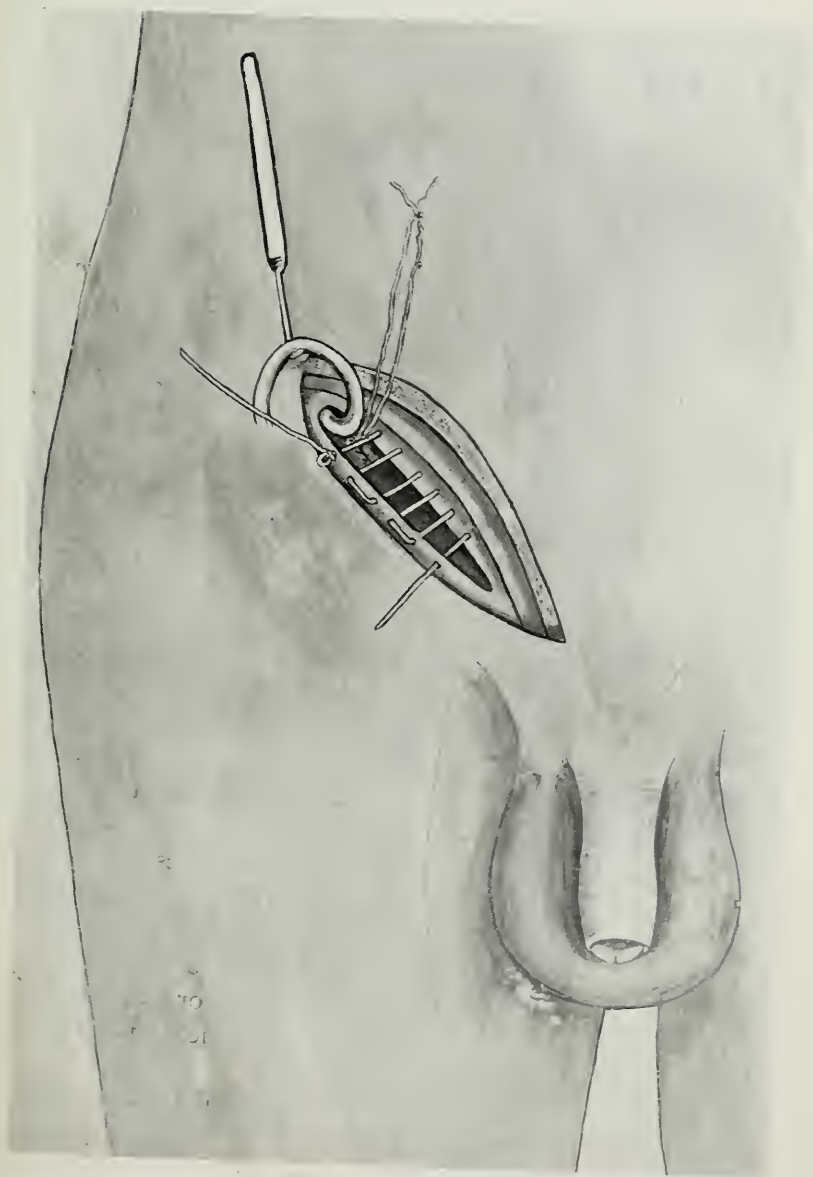


FIG. 6.—Basting suture uniting Poupart's ligament to conjoint tendon in the imbricating operation for hernia.



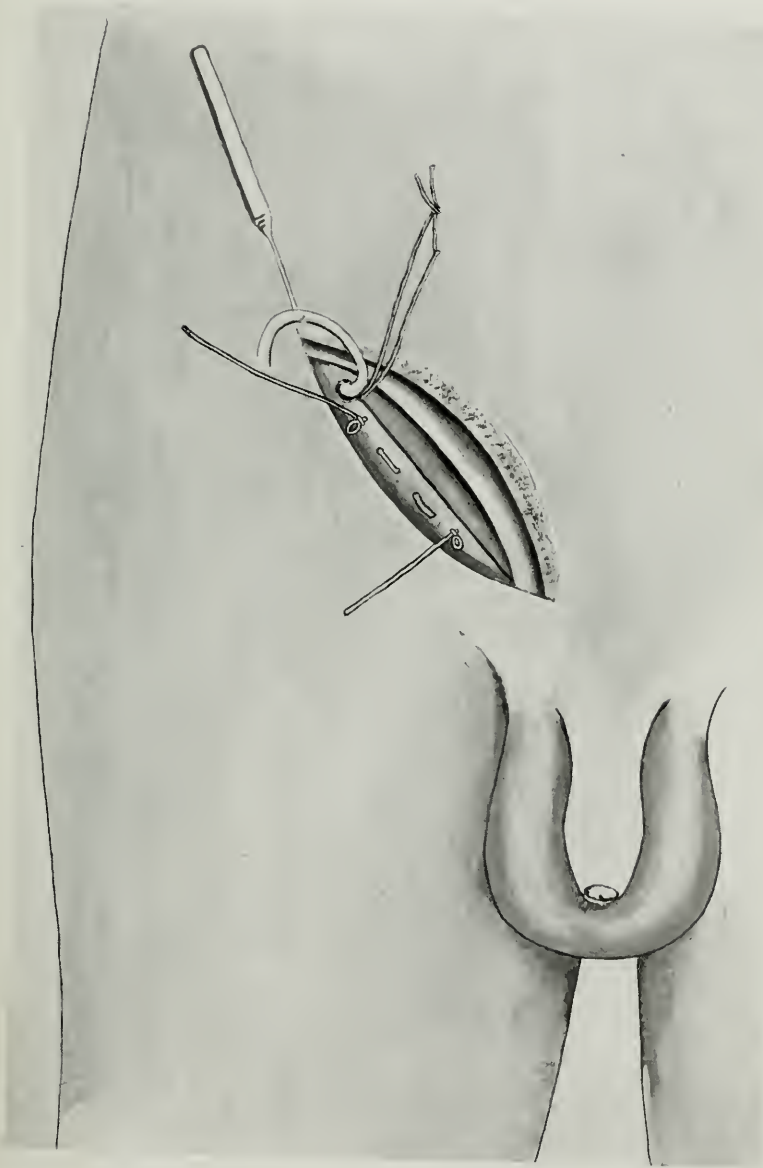


FIG. 7.—Basting suture uniting Poupart's ligament to conjoined tendon tied in position.



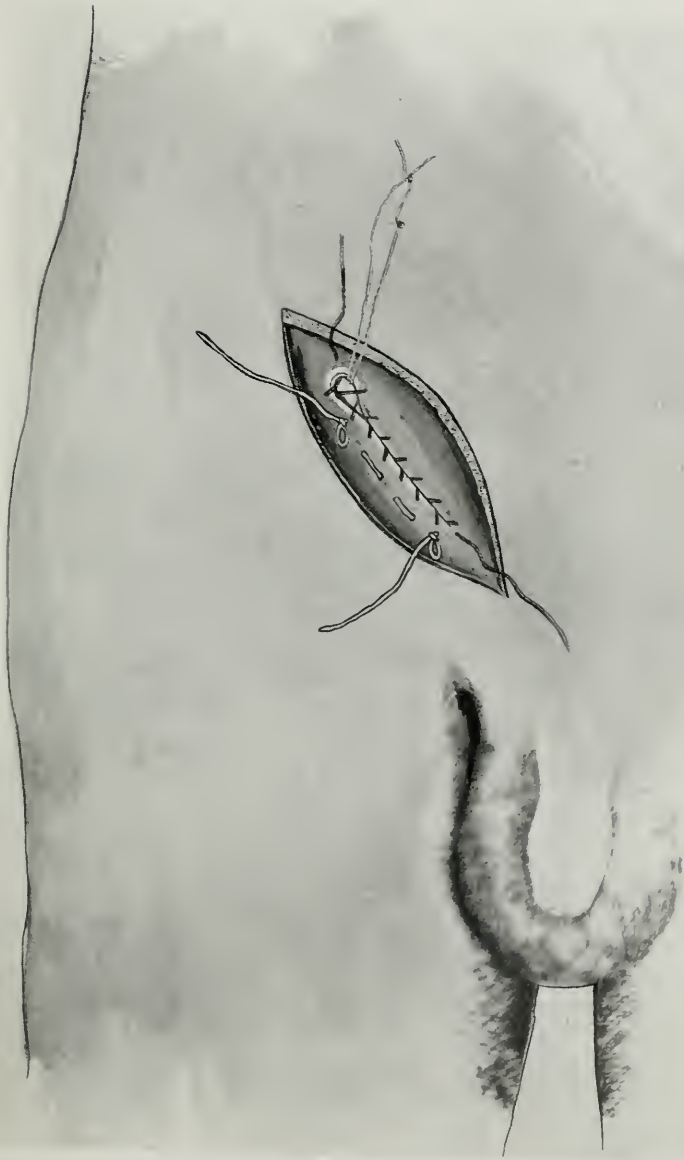


FIG. 8.—Suture of fascia of external oblique muscle to Poupart's ligament over the cord by continuous herring-bone suture.



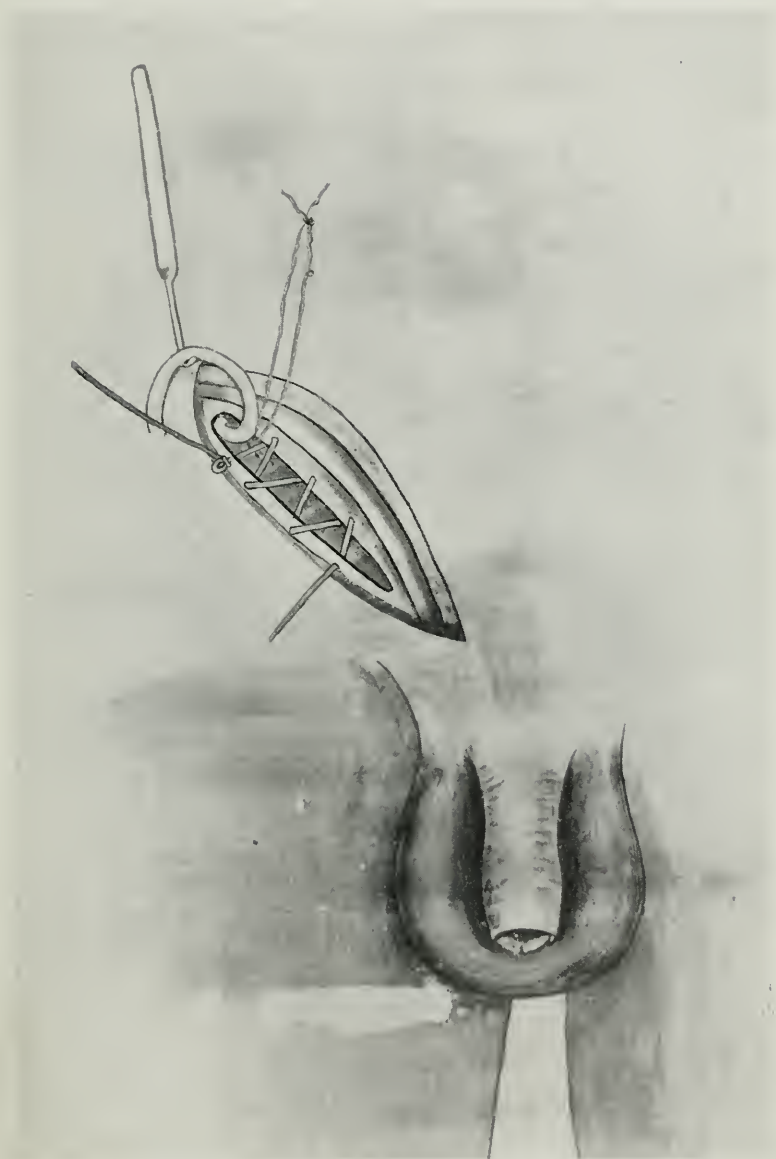


FIG. 9.—Suture of Poupart's ligament to conjoined tendon by continuous herring-bone suture, producing edge to edge apposition as in Bassini's operation.





FIG. 10.—Suture of Poupart's ligament to conjoined tendon by continuous mattress suture, producing the same apposition of tissue as in Halstead's operation.



tion, can be accomplished by a continuous herring-bone suture (Fig. 9) of silkworm gut tied at each end in the ligament with the reverse bow-knot.

The suturing of Poupart's ligament to the conjoined tendon by a continuous mattress suture (Fig. 10) of silkworm gut tied at either end in the ligament produces the same apposition of tissues as in the Halstead operation with the buried interrupted mattress suture of silver wire.

In general, the advantages of this method of suture are:

(1) Certainty that all suture or ligature material placed in the wound has been made sterile by boiling in water.

(2) Accurate layer approximation of tissue.

(3) Removal of the buried sutures when healing is complete.

(4) Capillary drainage from each layer.

(5) Safety of intestines from injury during the application of the sutures.

(6) Rapidity of application.

(7) Minimum line of irritation on the peritoneal surface and consequent adhesions to the viscera.

(8) Slight scar in the skin, there being no perforation of the skin by sutures.

(9) All of the advantages of a permanent buried suture without the danger of future irritation and extrusion of the knot.

(10) The advantages of an absorbable suture without the danger of sepsis from the suture, and without producing a nidus for septic germs from the blood current during absorption.

In the seven months following January 3, 1901, the date of the initial use of the knot, I have used this method in eleven median laparotomies, in eight appendectomies, in four ventral herniotomies, and in seventeen inguinal herniotomies, all of my abdominal operations that were closed without drainage, and obtained sterile primary union in every case. The most recent

of these cases being now six weeks from operation and safe from suppuration.

The claim for originality which is maintained is not in the use of a longitudinal suture, but in the tightly and securely tying of a buried longitudinal suture which can be easily removed when healing is complete.

EPIPLOPEXY IN CIRRHOSIS OF THE LIVER WITH ASCITES.¹

BY GASTON TORRANCE, M.D.,

OF BIRMINGHAM, ALABAMA.

TALMA, of Utrecht, was the first to suggest establishing a collateral circulation by means of adhesions between the abdominal viscera and the parietes for the relief of ascites in cases of cirrhotic liver. The first three operations cited below were performed in Holland as a result of this suggestion.

At the time that these operations were being done in Holland, Drummond and Morison designed the same operation independently; Morison did two operations, and must be credited with being the first to present a successful case to the profession.

CASE I.—Van der Meule in 1889 operated upon a man with cirrhotic liver, probably stitching the omentum in the wound. He died immediately of shock.

CASE II.—In 1891 Schelkly had a case similar to this, and did the same operation. He became delirious during the night and tore the dressing off, and infected the wound; he died of peritonitis on the fourteenth day.

CASE III.—The next case is that of Thomas Lens, operated upon in 1892. The patient was a male sixty-one years of age, who had atrophic cirrhosis of the liver. The omentum was stitched in the wound, and he made a good recovery; but there was no relief from the ascites; this was supposed to be due to the condition of the liver. He lived for six months after the operation. At the post-mortem the omentum was found adherent to the abdominal wall and contained moderately enlarged blood-vessels.

¹ Read before the Jefferson County Medical Association, September, 1901.

CASE IV.—Drummond and Morison, September, 1894. The patient, a female forty-two years of age, first noticed her feet and legs swelling in the early spring of 1893. In May she was tapped for the first time. Between May and August she was tapped forty-eight times, with an average of twelve pints of fluid each time. Beyond a great distention of the abdomen, nothing was found. Her health had been good until about a year before the abdomen began to swell. There was no history of alcoholism. The abdomen was opened below the umbilicus and dried out with sponges. The liver, spleen, and parietal peritoneum were sponged. The omentum was sutured to the anterior abdominal wall. A glass tube was passed down into Douglas's pouch for drainage. Adhesive strips were applied to the abdomen down to the tube. The tube was left in place for fourteen days; after it had been removed, the wound soon closed, and in a short time the abdomen became distended again, and she was tapped sixty-nine times during the remaining nineteen months of her life. A post-mortem was not made.

CASE V.—Drummond and Morison, October, 1895. A woman, thirty-nine years of age, became ill early in 1895, vomited blood, and became jaundiced. The jaundice continued for several months; the distention became so great that it was necessary to tap her about the middle of July and about every three weeks thereafter until operated upon, the fluid increasing every time. Previous to this she had always enjoyed good health. She drank quantities of spirits and wine. When admitted for operation, she was very much emaciated, and could only rest in a sitting posture. The same operation was done as in the above case. The first ten days the tube was frequently pumped out. Three weeks after the operation no fluid was escaping and the tube was removed. The patient went home perfectly well. Eight months after the operation she developed a slight ventral hernia. This increased in size, and was operated upon two years later. The peritoneum was not opened. After the operation, she complained of numbness of the extremities, became jaundiced, and died the next day. Post-mortem, the liver, spleen, intestines, and omentum were found attached to the parietes by numerous band-like adhesions, many of which contained very little except blood-vessels. Some of these were four inches long and as large as the radial artery. The liver was much atrophied and degenerated. Micro-

scopically, it showed fatty degeneration. Normal cells were few and were found in the centre of the lobes.

CASE VI.—This very interesting case was operated upon by Talma in March, 1896. The patient was a boy nine years of age, whose spleen and liver became enlarged without any known cause; he also had parenchymatous nephritis. This responded to treatment. There was no abatement of the ascites, and an exploratory laparotomy was done with the expectation of finding tubercular peritonitis; the peritoneum was normal, and the abdomen was closed. The kidneys continued to improve, and, after several tapplings, the abdomen was again opened and the omentum and the gall-bladder were sutured to the abdominal wall. A perfect result was obtained; there was no recurrence of the ascites. The spleen did not decrease in size, and was sutured into a pocket of the peritoneum, this being the third operation. Two years after operation, he was perfectly well. The spleen had grown much smaller, and the liver was performing its functions.

CASE VII.—R. Morison, in January, 1897, operated upon a man forty-two years of age, who had been a moderate drinker, for cirrhosis of the liver. Two incisions were made, the lower one being used for drainage. A typical hobnail liver was found, which was somewhat contracted. The spleen was six times its normal size. The abdomen was sponged dry. The liver, spleen, coils of intestines, and parietal peritoneum were rubbed with a sponge, and the omentum was sutured to the abdominal wall. For three weeks he was alternately excited and depressed. He made a good recovery, and two years later the medical examiner of a well-known insurance company passed him as a first-class risk.

CASE VIII.—This case is the fourth operated upon by Morison, and was done two months after the one above. The patient was a very stout woman, fifty-four years of age, whose legs and abdomen had been swollen for eighteen months. Two weeks prior to the operation, the abdomen was tapped and five and a half gallons of fluid were withdrawn. The abdomen was still very much distended, and a round, elastic tumor could be outlined, which proved to be an ovarian cyst, requiring an extensive dissection for its removal. The liver was found to be cirrhotic, with enlargement of the spleen and omental vessels. The abdomen was closed without drainage, and the patient did well for a

week, when she developed diarrhœa and went down rapidly, and died on the eleventh day, cirrhotic kidneys being the cause.

CASE IX.—Narath and Talma, October, 1898. The patient was a male fifty-nine years of age. The liver was hard and nodular, with a thickened capsule. The spleen was very much enlarged. Before the operation the patient had been very much depressed at times; this returned after the operation, with delirium. He eventually recovered from this. The operation consisted in sponging the omentum and parietal peritoneum and suturing them together. There was no return of the ascites.

CASE X.—R. F. Weir, November, 1899. A man thirty-nine years of age, a wine taster by trade; first noticed his belly becoming distended two years before. He became jaundiced in March, 1898, and remained so three weeks. He was tapped in August and every week thereafter. He lost twenty-five pounds in weight. His urine showed a few granular casts, but no albumen. Heart normal, liver and spleen much enlarged. Incision made over the right rectus muscle in its upper third. The abdomen was dried out with sponges. The surface of the liver and adjoining peritoneum was scratched with a hat-pin, and the omentum was sutured to the abdominal wall; a small opening was made above the pubis for drainage. Adhesive strips were applied down to the drainage tube. The patient died on the fifth day. A large echinococcus cyst was found in the right lobe of the liver, pushing up the diaphragm. Death was due either to this cyst or infection from the tube.

CASE XI.—A. E. Neumann, November, 1898. A female forty-five years of age, with a hard, firm, and smooth liver and enlarged spleen, was operated upon for the relief of the ascites. The parietal peritoneum was curetted and the omentum sutured to it. She made an uneventful recovery, but had a trace of the ascites left. Six months later this had disappeared, and she was apparently perfectly well. The veins of the abdomen and around the umbilicus became quite prominent.

CASE XII.—Emil Ries, 1899. The patient was a woman, who had been well until the winter previous to this, when she began to suffer with pains in the region of the stomach. She lost about seventy pounds in weight during the winter: was having hæmorrhages from the bowels almost daily. There was a mass in the region of the liver. There was no œdema or ascites; no history

of syphilis or alcohol. At the operation, the liver was found to be deeply furrowed and cirrhotic, and showed some adhesions to the parietal peritoneum, with some enlarged vessels. The omentum was sutured to the abdominal wall. The patient was allowed to sit up in twenty-four hours, and walked around in three days and went home on the seventh day; has not had a single hæmorrhage since the operation.

CASE XIII.—Narath and Talma, March, 1899. The patient was a woman sixty-seven years of age, who had had a chronic peritonitis, producing cirrhosis of the liver. The ascitic fluid was chyle-like in character. The area of liver dulness was decreased. At the operation, the liver was found to be very small, hard, and nodular, and markedly fibrous. The omentum was sutured to the abdominal wall. The wound was closed without drainage. The patient recovered, but there was no improvement in the ascites.

CASE XIV.—Folmer and Talma, May, 1899. This patient was a male, who had also had a chronic peritonitis, which produced the cirrhosis of the liver. At the time of the operation numerous adhesions were found between the liver, spleen, omentum, and abdominal wall. The parietal peritoneum was scraped and the omentum sutured to it. The liver was enlarged, hard, and nodular. The patient recovered, but there was no relief from the ascites.

CASE XV.—Rolleston and Turner, July, 1899. A man forty-five years of age was admitted to St. George's Hospital, June 22, having vomited three quarts of blood during the previous forty-eight hours. He was a constant drinker of beer, and had syphilis twenty-seven years before. The spleen was enlarged, but the liver was not. For several weeks prior to operation he had a slightly elevated temperature. There was great abdominal distention, with œdema of feet and legs. Sixteen pints of fluid were withdrawn by tapping on the day of the operation. An incision was made parallel with and a short distance below the costal margin. Liver hobnailed. The surface of the liver was sponged and a suture passed through its edge, the omentum, and cut edge of wound, and then tied. No drainage. There was a steady improvement in his condition. He was somewhat depressed for a time, and for a short while complained of a

dragging sensation. When seen four and a half months later there was a trace of ascites and œdema of the feet.

CASE XVI.—Rolleston and Turner, July, 1899. A Frenchman, fifty-two years of age, was admitted to St. George's Hospital, June 21, having noticed the ascites two months, and the œdema of the feet only two weeks before. He had suffered with morning vomiting for four months and pain over the liver for two months. He drank large quantities of wine. Four days after admission, eighteen pints of fluid were drawn off. The liver was found to be markedly cirrhotic. These surfaces of the liver and diaphragm were sponged and scratched with the finger-nail and director. The margin of the liver was sutured to the abdominal wall. The patient recovered, but there was no relief from the ascites. He was tapped twelve days later, and this was repeated four times during the month following. When heard from two months later, he was very ill with distended abdomen and œdema of feet and legs.

CASE XVII.—Grinon, in November, 1899, operated upon a woman, forty-seven years of age, for ascites. The parietal peritoneum was detached and the omentum was sutured between. Wound closed without drainage. The patient's general condition improved, and the ascites was diminished. The urine was scanty prior to operation, but became normal afterwards. The veins of the abdomen became very much enlarged.

CASE XVIII.—A. A. Bobroff, November, 1899. The patient was a woman thirty-eight years of age, with atrophic cirrhosis of the liver. Medical treatment seemed to do no good, and an operation was decided upon. The abdomen was opened under cocaine, and a large amount of fluid evacuated. The peritoneum near the wound was scraped with a sharp spoon. The omentum was sutured to the upper and lower angles of the wound, the suture passing through the abdominal wall. The abdomen was closed without drainage. The operation lasted fifteen minutes. The patient made an uneventful recovery, and gained in weight and strength. There was a slight accumulation of fluid. The veins around the umbilicus became enlarged.

CASE XIX.—Bossowski, in 1900, operated upon a little girl nine years of age, with cirrhotic liver, for the relief of the ascites: cholecystotomy was done. Her general condition was improved, and the amount of the ascites decreased and returned more slowly.

CASE XX.—C. H. Frazier reports a case operated upon in July, 1900. The patient was a laborer of middle age, who gave a history of syphilis, and was a constant user of alcohol and tobacco. He had a systolic murmur with enlargement of the heart, liver, and spleen. The extremities were œdematous and the abdomen greatly distended. The urine showed albumen, but was otherwise negative. He was tapped four times during the two months prior to operation. A local anæsthetic was used to open the abdomen, but the pain caused by handling the viscera made it necessary to administer ether. The parietal peritoneum was sponged and the omentum sutured to it. The abdomen was closed without drainage. Tapping had to be resorted to on the thirteenth and thirty-sixth days after operation, 328 and ninety-six ounces respectively being withdrawn. Three months after, there had been no return of the ascites, and the patient was able to be out of doors daily.

CASE XXI.—Packard and Le Conte report two cases operated upon October 13, 1900. The first was a white man thirty-six years of age, who had been a constant drinker of beer and whiskey. There was no history of syphilis. He had noticed some swelling of the lower abdomen for the past five years. Tapping was resorted to four times during the two months prior to operation. His urine showed a few hyaline casts. Two incisions were made, the lower one being for drainage. A small, hard liver and a very much enlarged spleen were found. The liver, spleen, and peritoneum were sponged and the omentum was sutured to the abdominal wall. Adhesive strips were applied to the abdomen. He made a good recovery from the operation, but was depressed at times. He lived sixty-one days after the operation, and died of heart failure and pulmonary œdema. Firm adhesions between the liver and the diaphragm and the spleen and abdominal wall were found post-mortem.

CASE XXII.—Packard and Le Conte. The patient was a white man fifty-two years of age, giving a history of syphilis, and whose mother and sister died of dropsy. He had been a hard drinker. For ten or twelve years he had been passing blood by the bowel. He had noticed swelling of the legs and abdomen about two and a half months before operation. Tapped only once. The operation was similar to the one above, except that the spleen was normal and was not sponged. The liver was hard and nodu-

lar and enlarged. The patient died of uræmia four days later. A post-mortem examination was refused.

CASE XXIII.—John B. Roberts reports two cases operated upon December 4, 1900. The first was a man forty-nine years of age, who was temperate in his habits, and whose father, although temperate, had died of cirrhosis of the liver. An exploratory laparotomy was done twenty-four days previous to this, after which he had partial suppression of urine with albumen and casts. The last operation was done under a local anæsthetic; the peritoneum was sponged, and the omentum attached to it by through and through sutures on either side of the wound. He died six weeks later of advanced liver and kidney disease. The omentum was found adherent to the abdominal wall.

CASE XXIV.—John B. Roberts. The patient, a man fifty-four years of age, had been a hard drinker. He had noticed some abdominal distention for eight months, and had been tapped nine times. His general condition was poor. His urine showed albumen and casts. A local anæsthetic was used. The abdomen was opened first below the umbilicus, but the omentum could not be reached, so that an incision had to be made above the umbilicus. The omentum was sutured, as in the above case. The patient died of uræmic coma the day following. All of the sutures had cut through except one.

CASE XXV.—N. M. Benisovitch reports a case twenty-two years of age with cirrhotic liver, probably due to alcohol, who was admitted to the hospital and tapped twice without any relief. A diagnosis of tubercular peritonitis was made, and the abdomen opened under a local anæsthetic. The peritoneum was not diseased. There was a temporary improvement after this, but the ascites returned. Talma's operation was done, and there was a marked improvement in the patient's condition. Two months later it was necessary to tap him. After that he gained flesh and strength rapidly.

CASE XXVI.—N. M. Benisovitch. A man fifty-six years of age, who gave a history of chronic alcoholism, "was far advanced in the disease when Talma's operation was done." He seemed much improved for two weeks, and then began to decline rapidly; he died within forty-eight hours. "A rapid and marked accumulation of fluid took place before he died."

CASE XXVII.—Muscroft and Ingalls's patient was a man

forty-five years of age, who had used wine, beer, and whiskey since early manhood. There was no history of syphilis. The symptoms noted were jaundice, abdominal distention, œdema of the feet and legs, and weak and rapid pulse. He was tapped once ten days before operation; slight improvements followed; but when operated upon, the distention was as great as at first, and the toxic symptoms were more pronounced. The urine was negative. Liver area was small. The operation was done under chloroform, two incisions being made, the lower one for drainage. The visceral and parietal peritoneum were sponged, and the omentum was sutured to the anterior abdominal wall. Adhesive strips were applied to the abdomen. Toxic symptoms developed during the night, and the patient died thirty hours after the operation.

CASE XXVIII.—Gaston Torrance, July, 1901. This case was seen first on the 8th of June, and the following history was elicited: J. T., aged forty-five years, white, a puddler by trade, married, an Irishman, had one sister to die at the age of twenty-eight with enlarged liver and jaundice; family history was otherwise negative. He has been a hard drinker of beer and whiskey for twenty-five years. There was no history of syphilis. He had malaria eight years ago and pneumonia four years later; has always enjoyed good health. About the middle of last December feet, legs, and abdomen began to swell. This passed off in about a week. He went back to his work, and experienced no inconvenience for two months, when the swelling returned. He has had pain in the epigastrium for the past eighteen months. When the abdomen becomes distended, he has pain in the region of the liver, with shortness of breath. Has lost twenty-five or thirty pounds in six months. He was able to work until about the middle of May; has not had any hæmorrhages from the mucous membranes. Breath sounds slightly roughened, but heard distinctly all over the chest. Some flatness at the bases posteriorly, probably due to the fluid in the abdomen. Heart sounds regular, slight accentuation of the second. Apex beat in sixth interspace four inches from the mid-line. Liver dulness extends from upper border of the sixth rib to within two inches of costal margin. The stomach enlarged and extending over into liver area. Spleen considerably enlarged. Feet and legs swollen and œdematous. Abdomen very much distended. Urine neutral in reaction,

specific gravity 1010, no albumen or sugar, no casts. The patient was put on diuretics and salines without any reduction of the ascites and oedema. This treatment was kept up until the 1st of July, when it became necessary to tap him on account of the dyspnoea. The abdomen at this time measured forty-two inches at the umbilicus. Three hundred and eighty-four ounces were drawn off, the fluid was neutral, specific gravity 1006, showed considerable albumen, and was examined for sugar with a negative result. The diuretic and saline treatment was continued with no apparent benefit; was tapped again eight days later, 256 ounces of fluid being drawn off; and again a week later, with 384 ounces as a result. He was admitted to St. Vincent's Hospital on July 20 for operation. He was passing a normal amount of urine at this time, which was of a dark, amber color, clear, acid, specific gravity 1030, no sugar or albumen found. Microscopically it showed crystals of calcium oxalate and uric acid, a few pus-cells, no casts. His blood examination showed hæmoglobin 65 per cent.; red corpuscles, 3,356,000; white corpuscles, 8000. Three days later, under ether, an incision about three and a half inches long was made through the right rectus muscle above the umbilicus. A large amount of fluid was evacuated. The spleen was very much enlarged. The stomach was distended and extended across in front of the liver. The liver was very small, hard, and nodular. The gall-bladder was distended, filling the hand when grasped. The surfaces of the liver, spleen, and parietal peritoneum were sponged and caused some oozing. Two chromicized catgut sutures were passed through the parietal peritoneum on either side of the wound with a small pedicle needle and through the omentum, and tied so as not to interfere with the omental circulation. The abdomen was flushed out with salt solution and closed with through and through silkworm-gut sutures without drainage. The following morning there was some hæmorrhage from the mucous membrane of the stomach, which was vomited. He complained of some pain in the right lumbar region the second day. An attempt was made to get his bowels moved without much success. The abdomen became somewhat distended; the temperature went up to 101° F., pulse 128, volume fairly good. His pulse and temperature remained about the same until a short time before he died. Early on the morning of the fourth day he became unconscious, with slow and very irregular

breathing. Believing that these symptoms were due to uræmic poisoning, he was transfused, about 1200 cubic centimetres of salt solution being used. There was only a slight reaction, and he died at 6 P.M., three and a half days after operation. A post-mortem examination was refused.

The operation was designed to relieve the portal circulation, it being supposed that the ascites was due to obstruction of the portal vein by the cirrhotic condition of the liver, and that if part of this blood current could be turned into the systemic circulation, the pressure in the portal vein would be lowered, and that the ascites would disappear. Rolleston and Turner argue that the ascites does not occur when the pressure in the portal vein is presumably the highest, *i.e.*, in the earlier stages when hæmatemesis occurs; but being a later manifestation, is rather the result of a toxæmic condition of the blood than a mere mechanical obstruction of the portal circulation, and that it is the outcome of a poison in the blood exerting a lymphagogue action. The toxæmic condition is due to the cirrhotic liver being unable to destroy the poisons which are continually passing to it from the alimentary canal, and these getting into the general circulation cause œdema of the legs and ascites. Numerous experiments have been made on dogs in which the blood from the portal vein was short circuited, passing into the inferior vena cava without having passed through the liver. When they were fed on meat, severe nervous symptoms were induced,—depression, asthenia, convulsions, and sometimes ending in death. One of Morison's cases was alternately excited and depressed for three weeks. One of Packard and Le Conte's cases was very much depressed at times, as was one of Rolleston and Turner's. This condition was probably due in these cases to the toxic material passing into the general circulation; but there was no return of the ascites, as the theory advanced by Rolleston and Turner would lead us to expect. Packard and Le Conte claim that hæmorrhages from the stomach and bowel appearing in the earlier stages do not necessarily mean that the pressure in the portal

vein is at its height, but may be interpreted as an attempt on the part of nature to establish a collateral circulation, and the bleeding being the result of a varicose condition of these vessels. They also suggest that, were the ascites due to this toxic material in the blood, we would find a dropsical condition in all parts of the body, brain, heart, etc.

There are a few cases on record that have been cured after repeated tapplings. R. L. MacDonald reports two cases; one of them was tapped sixty times, 9000 ounces of fluid being withdrawn; four years later there had been no reaccumulation. The other case was tapped thirty-one times with about 8600 ounces of fluid as a result. At first he was tapped every two or three days, and later about once a week, until finally it disappeared altogether.

Drummond has posted a number of cases of cirrhosis of the liver in which there was no ascites, and found vascular adhesions between the viscera and parietes, which probably accounted for the absence of the ascites. In some of these cases the cirrhosis had existed nearly twenty years. Sappey gives the following as the normal collateral circulation of the portal system. Veins connecting the portal vein with the phrenic vein and vena azygos major, and running subperitoneally between the folds of the hepatic ligament. Another large vein running in the round ligament connects the left branch of the portal with the epigastric and other veins of the abdomen. The coronary veins communicate freely with both azygos veins through the œsophageal plexus and the inferior mesenteric with the internal iliac by means of the middle and inferior hæmorrhoidal plexuses. These veins become very much enlarged, and in some cases do succeed in diverting the blood current when the portal vein becomes obstructed; but in the majority of the cases it becomes necessary to increase this collateral circulation, and this is best accomplished through the omentum.

With the histories of twenty-eight cases before us, the following conclusions have been summed up:

Rutherford Morison.

"(1) Ascites due to liver cirrhosis can be cured by the establishment of an efficient anastomotic circulation.

"(2) Adhesive peritonitis produces adhesions between the abdominal contents and its parietes in which new blood-vessels form. If there is any demand for the new blood-vessels, they remain permanently.

"(3) The operation described in the paper by Drummond and myself is the safest and most certain method of producing adhesions.

"(4) It is no longer advisable to treat the ascites due to cirrhosis by repeatedappings if the patient is otherwise sound and in fair general condition. After one or twoappings have failed, operation offers the best chance of prolonged and useful life. The obstructed portal circulation has nothing to do with the enlargement of the spleen."

Rolleston and Turner hold that the operation benefits the patient

"(1) By somewhat diminishing the flow of blood through the liver, it may enable that organ to deal more satisfactorily with the blood passing through it, and so reduce the toxæmic condition of the blood, which is probably the important factor in inducing ascites.

"(2) That the increased vascular supply to the surface of the liver may, by improving the nutrition of the hepatic cells, enable them to undergo compensatory hyperplasia. The compensatory hypertrophy of the liver will enable the organ to perform more efficiently its important antitoxic functions, and so lead to a latency of the symptoms."

Packard and Le Conte.

"It is our opinion that where the diagnosis of pure portal cirrhosis of the liver can be made, and where persistent and well directed medical treatment is productive of insignificant results, that the operation should be strongly recommended. On the other hand, it would seem that the operation is scarcely indicated, if not contraindicated, in cases of ascites associated with other kinds of cirrhosis (Hanot's, syphilitic, mixed, etc.), or with chronic peritonitis."

Muscroft and Ingalls.

"(1) Prognosis is very bad in those cases of long standing presenting toxic symptoms.

"(2) Results under both general and local anæsthetics are about equal. Theoretically, local anæsthesia should be used.

"(3) Shock is not noticed, these patients being in better condition after than before operation, due, no doubt, to the briefness of the operation and the inhibitory action of the bile.

"(4) Transfusion should be practised at the time of the operation.

"(5) Early operation should be advised."

John B. Roberts.

"Epiploexy should, in my opinion, be done as soon as practicable after the diagnosis of cirrhosis of the liver is made. In late cases the operation will probably not be of much therapeutic service. It seems as if there were good physiological grounds for believing it advantageous in early cases."

C. H. Frazier.

"The operation should be performed preferably under local anæsthesia, as individuals afflicted with cirrhosis of the liver are usually alcoholics, and belong to a class in which ether narcosis of itself has a very material effect upon the mortality.

"The chief indication for the operation is the presence of ascites due to obstruction of the veins of the portal system, when the obstruction itself is due to cirrhosis of the liver. It should be borne in mind, however, that the operation is not indicated in every case of hepatic cirrhosis with ascites: the operation is absolutely dependent for its success upon the retained function of the liver cells. It has been suggested that the presence of cardiac or renal disease should constitute a contraindication, but this might be regarded rather as a relative than as an absolute one."

Of the ten cases of this series that were cured, seven of them simply had the omentum sutured to the abdominal wall, Cases VI, IX, XI, XII, XVIII, XX, XXV. In Case

VI, Talma did suture the gall-bladder also, but the surfaces of the spleen and liver were not irritated at all. I am convinced that this is the best operation, as there is always more or less oozing from these irritated surfaces, and this makes an excellent culture medium for any germs that may accidentally get into the abdomen. Besides, the operation was designed to relieve the strain on the liver-cells, and we should attempt to divert as much of the current from the liver as possible. I, therefore, believe we should not attempt to form any adhesions between the liver and the abdominal wall. If I should have an opportunity to do the operation again, I shall tap my patient the day of the operation, and make a small incision with a local anæsthetic, and simply suture the omentum without even exploring the abdomen.

The following table is an epitome of these twenty-eight cases:

Death within two days.....	3	10.72 per cent.
Death within one week.....	3	10.72 per cent.
Death within two weeks.....	2	7.13 per cent.
Death ultimately	5	17.86 per cent.
Cured	10	35.72 per cent.
Improved	2	7.13 per cent.
Unimproved	3	10.72 per cent.
	<hr/>	<hr/>
	28	100.00 per cent.
Died	13	46.43 per cent.
Recovered	15	53.57 per cent.
	<hr/>	<hr/>
	28	100.00 per cent.

If we deduct from the table Morison's case, VIII, which had a large ovarian cyst, and Weir's case, X, which had a large echinococcus cyst of the liver, it will read as follows:

Death within two days.....	3	11.53 per cent.
Death within one week.....	2	7.70 per cent.
Death within two weeks.....	1	3.84 per cent.
Death ultimately	5	19.23 per cent.
Cured	10	38.47 per cent.
Improved	2	7.70 per cent.
Unimproved	3	11.53 per cent.
	<hr/>	<hr/>
	26	100.00 per cent.

Died	11	42.30 per cent.
Recovered	15	57.70 per cent.
	<hr/> 26	<hr/> 100.00 per cent.

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ON SPLANCHNOPTOSIS AND ITS SURGICAL
TREATMENT, WITH REPORT OF
A CASE.

By HENRY ALLISON INGALLS, M.D.,

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GLÉNARD, in 1885, was the first to completely describe this condition and show the fallacy of such diagnoses as nervous dyspepsia, hysteria, and nervousness, as was then applied to this class of patients.

In spite of the fact that sixteen years have elapsed, the etiology is unknown and the treatment still a matter of dispute.

Among the earliest theories advanced as to the cause of the condition was that of relaxation due to rapid pregnancies, the advocates of this theory claiming that the absorption of the fat about the abdominal organs, together with a flabby state of the anterior abdominal muscles, caused a change in the intra-abdominal pressure that allowed the organs to descend. The shape of the solid organs and the imprint upon them of other organs adjacent gave this view many advocates, but, as the condition became better known and more cases were reported, it was found the condition was just as frequent among those who had never been pregnant and those whose pregnancies had been far apart.

A few cases giving history of trauma, this was considered the cause, but is a theory that cannot be accepted for the reason that many cases give absolutely no history of trauma. It is a well known surgical fact that, even in extremely lean individuals, the various organs rupture, instead of becoming displaced, as a result of injury. If trauma were the cause, the condition would be more frequent in males, who are subject

to the majority of injuries, while statistics show that four-fifths of the cases are women.

Tight lacing was advanced by some as the cause, but we find the condition in those who have never laced. The "corset liver," not a displaced one, is the usual find where lacing has been practised for a long time. Treves¹ says tight lacing is not thought to be an etiologic factor.

In those cases presenting tumors of liver, spleen, or pylorus, the extra weight has been considered the cause in these particular individuals, but will not be discussed here, as the purpose of this paper is to treat of the condition in people presenting apparently normal viscera.

Congenital weakness or those of a lean habit, with long, narrow, precociously ossified thorax, wide intercostal spaces and frequently presenting Stiller's stigma of fluctuating tenth rib, in short, those with a plithisical habit, are supposed to be predisposed to the condition. Diaphragm here occupies a low position, and the organs descend for want of room in normal positions, is the opinion of Rose.²

There can be no doubt that there must be other causes, else more of the type just mentioned would present the condition under discussion. The writer is of the opinion that we must look to the nervous system for the immediate cause; that the condition is due to a trophic disturbance which causes atrophy of the ligaments supporting the organs involved and the tissues of the anterior abdominal wall. I have arrived at this opinion by a process of exclusion, so have no suggestions to make as to the cause of the trophic disturbance. It is not my purpose to claim this the etiologic factor in every case, but is advanced to cover the larger percentage of cases reported to date, where the other causes advanced will not apply. All are agreed that atrophy of the ligaments and relaxation of the anterior abdominal wall are present in each case, regardless of theories advanced, which is the important point as far as surgery is concerned.

Treves³ describes the process of ptosis as follows: The right bend of the transverse colon is said to be the first to

descend, drawing down the stomach, and a little later the remainder of this portion of the colon comes down. The small intestine becomes prolapsed, causing the lower abdomen to become prominent, while the upper is flattened. The liver and kidney become loose and the liver is found to occupy an unduly low level. Other investigators do not fully agree with Treves in this, Meinert² having found the hepatic flexure in its normal position in thirty-four out of 100 cases.

In reviewing the symptoms of splanchnoptosis we will not consider those cases in which there are no subjective symptoms, these in all probability being congenital conditions, and, as such, should not be given treatment of any kind as long as the condition causes them no distress.

The symptom most annoying to the patient is a sense of weight and sickening dragging in the upper part of the abdomen when in the upright position. This is slight when first noticed, but gradually becomes more severe until patient is practically bed-ridden. The anorexia is very marked, and patients experience much distress after food, even when the lightest of diet is used. The bowels are irregular; in the earlier stage of the condition a stubborn diarrhoea is usually present, which resists all lines of treatment; this is followed by constipation, which continues until relief is afforded. The bowel movements are attended by pain. After evacuation, patient complains of extreme weakness, or "all-gone" feeling in the abdominal cavity. The stomach and intestines are dilated, the tongue thickened and coated, the skin dry and scaly, and mucous portion of lips pale. Pain in the left groin, probably due to pressure on ovarian tissues, and marked tenderness in the epigastric region are complained of. The prominent aortic pulsation of gastroptosis is to be noticed. When patients change from the prone to the upright posture distressing palpation and shortness of breath are produced, which pass away in a few moments' time. These patients walk or sit in a stooping position, and before making a movement of any kind it will be noticed that they make pressure over the lower

abdomen with their hands. The only position they can assume which gives them absolute comfort is flat upon the back.

The most unfortunate feature of the condition, from the patient's point of view, is the lack of objective symptoms when a hasty examination is made. They are slightly anæmic and appear to be somewhat below par, but do not have that look possessed by the average individual, who has a condition that incapacitates for any and all duties; and it is, no doubt, this fact that causes many of this class to be drugged for years and to drift from one man to another in the search of relief. When these patients are seen lying upon their backs, they are perfectly comfortable, and when such a case is seen, presenting the subjective symptoms mentioned, a thorough examination is indicated before being lightly dismissed as hysterical.

It is obvious the treatment must be mechanical; either a thorough suturing of the organs in position, or an attempt made to hold them in position by means of abdominal bandages or other form of external support.

Good results are claimed by a number of writers for the latter mode of treatment. These, if severe enough, will no doubt relieve the dragging to a considerable degree; but as the tissues involved become further atrophied, as a result of the external pressure, the support must be made heavier and exert more pressure. This must continue until the limit of endurance to pressure is reached, when the patient becomes bed-ridden or practically so.

While the surgery of this condition is as yet in its infancy, it would seem from the good results thus far obtained that these cases should go to the surgeon. The operation to date is without known mortality, and it can scarcely be advocated that an abdominal bandage, or any form of external support, can retain the organs so well as sutures; while all will be forced to admit they must necessarily do more harm in interference with circulation, proper play of muscles, and functional activity of the abdominal organs, than the surgical procedure.

Billroth was the pioneer in surgical work of this nature,

he having sutured a lobule of the liver in place while doing a laparotomy for another condition.

Among those who have successfully operated primarily for this condition are Treves,³ Lannelongue and Faguet,⁴ Richelot,⁵ Blanc,⁶ Gérard-Marchant,⁷ Peters,⁷ Terrier et Boudouin,⁷ and Binnie.⁷ These were all immediately successful except the case of Gérard-Marchant, who did not obtain complete relief until the right kidney, also movable, was sutured in place.

The history of my case is as follows:

Mrs. M., aged thirty years. Family history good. Never pregnant. Usual diseases of childhood. No serious illness. No fatiguing duties. Hygienic surroundings always good. Never engaged in violent exercise; took daily drives. Until eight years ago was apparently in perfect health. About this time, while standing at a table doing some light duty, she experienced a sensation in the upper portion of the abdomen that felt as though something in this region had suddenly torn from its moorings and dropped below its normal position. A slight dragging sensation followed, which has been continuous whenever patient was in the upright position, gradually growing more severe. For a time after the beginning of the dragging, this symptom could be almost entirely controlled by tightening the clothing about the waist, so that patient did not seek medical advice. The clothing was made more close fitting from time to time, with temporary relief, but the condition finally became so annoying that it was thought best to consult the family physician. By this time patient and her family had noticed lack of appetite, distress after food, and loss in weight. The physician consulted attributed all symptoms to some uterine disorder, and began a local treatment, which was continued for some time, but afforded not the slightest relief. About one year after the beginning of the trouble, the loss of appetite and distress after food not having been relieved by the family practitioner, a specialist was consulted, who practised lavage, with an acid mixture after meals, which afforded considerable relief as far as the gastric distress was concerned, but did not relieve the miserable dragging in the least. After this treatment ceased all the symptoms soon returned, and the patient, disappointed but not discouraged, began to drift from one man to

another, the majority telling her she was suffering from nervous dyspepsia, while some intimated there was practically nothing the matter with her except a very large imagination.

Some four years ago she was ordered to the mountains for the summer, and while there a local physician made a diagnosis of floating (right) kidney, and advised operation. This was not considered by the husband, he being opposed to operative interference of any kind. On arrival home the family physician concurred in the diagnosis of floating kidney, but would not advise operation, claiming as good results would follow the use of an abdominal belt, with kidney pad, which was ordered and fitted. This afforded considerable relief for a time, but as the atrophy became more marked it was found a heavier and stronger belt was necessary to give relief. The patient, who is a woman of education and culture, noticed that the principal dragging was relieved by the abdominal binder, even when the kidney was below the belt. This fact was not satisfactorily explained at that time. She continued to lose in flesh and strength, and the second belt lost its efficiency; so a third one, more severe in type and made to include all the space between the iliac crests and costal margins, was ordered. This was applied by an assistant, so tightly was it necessary that it be drawn to afford relief.

The stubborn diarrhoea which existed in the earlier stages of the condition had given way to chronic constipation.

The patient having lost in weight from 140 to 115 pounds, it was decided she spend a winter in California, as all drugs tried in her case seemed powerless to create an appetite or relieve her distress. While there the patient decided to have the offending kidney sutured in place. A well-known surgeon was called, who, I believe, from statements made to patient and friends, fully recognized the condition. He found the right kidney much hypertrophied, and rightly concluded it should go back to its normal position. The operation was highly successful in every particular. To the patient's surprise the dragging was not relieved by the operation. She returned to her home in this city something more than a year ago, being informed by the California operator that she would have to undergo another operation, the kidney occupying as much time as he cared to consume at one sitting, her condition not being very good.

On her return to this city I saw the case for the first time.

Being not only a woman of education, but one of observation and a seeker of more knowledge, she had made a careful record of her case, so was able to give a very clear history and intelligent description of her condition. A sickening, dragging sensation in the abdomen, particularly noticeable above the umbilicus and from the median line to the right, whenever she assumed other than a prone position, which patient said conveyed the impression that a hand had hold of all the contents of the upper abdomen and was trying to drag them down into the pelvis, was the symptom that caused the greatest distress. When the change from the prone to the upright posture was made, severe palpitation and embarrassment of respiration ensued, which passed away in a short time, but returned on exertion unless support was given by means of abdominal bandage or pressure of hands. She possessed not the slightest desire for food, and the lightest of diets caused considerable distress. She forced a certain amount of food each day, which seemed to be fairly well digested, although there was always a good deal of fermentation that added to her discomfort. A laxative was being used daily, the bowels having refused to act without this aid since the diarrhœa of the earlier stage of the condition. The bowel movements were accompanied by pain, and produced a sense of great weakness in the abdominal region. The movements were not well formed and contained a large amount of mucus. When taking exercise, which usually consisted of short drives about the neighborhood, a pain in the left groin was noticed, especially if the lower abdomen was not firmly supported. This, I think, was due to pressure, as patient was free from it when she did not leave her bed. The abdominal supports had made life fairly comfortable for a time, but the limit had been reached, so patient was practically bed-ridden.

An examination revealed a yellowish cast to the sclera; the tongue thickened and coated; patient anæmic and tissues poorly nourished; skin dry and scaly; heart and lungs normal. The abdominal muscles were found thin and relaxed. The aortic pulsation was very marked, and so strongly suggested aneurism that one could scarcely credit the negative result of examination for thrill and bruit. (Under the influence of the iodides this pulsation was less marked.) There was much tenderness in the median line above the umbilicus. The stomach and intestines were distended. Spleen normal, but the liver a little more than

an inch below the normal site. The right kidney easily palpable, but not the left. Uterus and appendages normal, with the exception of excessive tenderness about the ovaries.

When patient assumed the upright position, which she did with much distress, the abdominal muscles contracted to their fullest extent in an effort to prevent further displacement. While examining the patient in this position, an organ could be detected below the left costal margin which was believed to be the left kidney, but which subsequent investigation proved to be the end of the left lobe of the liver. The displacement of the liver was downward and to the left; the right lateral ligament, although relaxed, seemed to bear almost the entire weight of the organ. The examination in this position was not as satisfactory as desired, owing to the contraction of the abdominal muscles, the recti standing out like ridges. The urine showed a low grade pyelitis and contained indican.

The question of treatment was easy. During her more than six years of illness everything in the way of drugs and external supports had been exhausted, and the progress had been from bad to worse, so that surgical interference was the only thing to be considered. The idea having been advanced that the surgeon should avoid this class of cases, the authors claiming the nervous condition was such that operation, while holding the organs in proper position, would not relieve the distressing symptoms (as seen in operations for varicocele, where the nervous condition is the same after as before operation), it was deemed best that a neurologist be called to investigate this important point of the question, and to this end my colleague, Dr. D. I. Wolfstein, was called in consultation. After a thorough study of the case, Dr. Wolfstein pronounced the nervous system in good shape and expressed the opinion that an operation was worthy of trial. The condition was then fully explained to patient, who elected operation.

She was given some preliminary treatment, and on August 6, 1900, at the Good Samaritan Hospital, assisted by Drs. Carothers and Webb, Dr. Allan Ramsey in charge of the anæsthetic, chloroform being used, an incision slightly to the left of the median line, to avoid injury to the ligaments, was made. The incision extended from just below the xiphoid tip to about one-half inch above the umbilicus. Beneath the incision were

found the liver and transverse colon. The right flexure of the colon seemed to occupy about normal position, the splenic flexure being lower than normal. The principal disturbance seemed to be from the median line to the left. The liver was normal in size and color and showed no signs of disease. The round and falciform ligaments were much atrophied. These ligaments were sutured to the anterior abdominal wall and to the costal margins with medium-sized silk, the surface of the liver having been slightly irritated with a dry gauze sponge to aid in the formation of adhesions. The return of the liver to its normal position, through the influence of the gastrohepatic omentum, drew the pylorus upward and to the right. The kidneys were found to be secure, the right one being somewhat hypertrophied. The pelvic organs were in good condition. After a careful examination of the abdominal contents, it was decided the mobility of the liver was responsible for the displacement of the other organs, so other procedures which had been thought of, such as shortening of the gastrohepatic omentum, were omitted, and the wound closed by through and through silkworm sutures.

The patient was kept absolutely prone for a period of six weeks so as to insure strong adhesions. When allowed to get up the scar tissue was protected by a Martin's bandage, which was worn for a period of three months. During this time the abdominal muscles were systematically exercised and improvement was the reward. The bowels moved without the aid of a laxative, the mucus disappeared almost entirely, and the movements were better formed. After operation a change from the prone to upright position caused no shortness of breath or palpitation, and the dragging in region of liver and stomach had disappeared, as had the excessive tenderness in the median line just below the xiphoid cartilage.

Since the first of the year patient has worn no support other than that afforded by the usual clothing, and has been able to use the trolley cars, do shopping, and visit her friends. She gained in weight from 110 to 124 pounds and had a good appetite. The only unpleasant sensation complained of when last seen in July was a bulging of the lower abdomen, accompanied by a dragging in the median line and along the descending colon. This, while very annoying, did not confine patient to the house or prevent her from being useful to herself or others; in fact, she

nursed her mother through quite a severe illness during the month of June, and in July went East unaccompanied. Her mother, who joined the patient later, advised on her recent return that her daughter had been enjoying the surf and had a splendid appetite. The abdominal weakness was still noticed, and patient became fatigued more easily than she did years ago, but was able to be up and about on most of the pleasure jaunts taken by the rest of the party.

The cause of the condition in this case is hard to determine; never pregnant, no history of trauma, no fatiguing duties, and nothing in the family or personal history that is chargeable. Being in comfortable circumstances, patient dressed in the styles of the day, so pressure of clothing causing atrophy of the abdominal muscles, with subsequent relaxation, or the idea advanced, that of trophic disturbance, may have been the cause. Certain it is, as far as the patient is able to determine, her health was perfect until the day she experienced the tearing sensation in the upper portion of the abdomen.

In considering the treatment of this condition, it would seem from the excellent results thus far obtained, and the total absence of mortality, that surgical interference is indicated, no matter what theory may be advanced as to the probable cause.

The advocates of the bandage treatment must admit that their patients are in continual distress from the pressure of the severe bandage that is necessary, and that it will in time aggravate the condition by causing a greater degree of atrophy of the structures involved, as seen in any tissue deprived of its function.

Bötticher,⁸ in speaking of this condition, says that when hepatoptosis is only a part of a general splanchnoptosis, simple hepatopepy is not indicated, but that a general reconstruction of the abdominal wall as performed by De Page offers the best hope of success. My case bears out the soundness of this teaching. Although the liver seemed responsible for the displacement of the other organs, there was some prolapse of the bowel from long-standing pressure and relaxation. This, we thought, would give no inconvenience after the cause was

removed, believing the abdominal wall could be restored by proper exercise, as its flabby condition was attributed mainly to atrophy as a result of the pressure from the bandages so long worn. Had the De Page operation been done in this case, I believe the result would have been perfect from the day the patient left her bed, as slight pressure just above the symphysis gives absolute relief from present symptoms, showing that laxness of the abdominal wall is now alone responsible.

In a recent communication, the patient advises that some weeks ago she was seized with an attack of intestinal indigestion, and was put upon a limited diet, which has been persisted in until she has sustained a loss of seven pounds in weight. Considerable fermentation is present, which adds to her discomfort. A recent examination shows that the liver and stomach are still holding in the position returned to at time of operation.

My only excuse for seeming carelessness, lack of thoroughness in the operation, is the excellent result obtained by Treves,³ whose case I had studied, and where the symptoms and history were almost identical with that of mine. His operation was a simple hepatopepy, and I did not feel justified in doing more than I did, with this fact in mind. While it is gratifying to know the patient is vastly improved, it is not pleasant to believe that another step added to the operation would have given absolute comfort, as seems to be the case here.

In conclusion, I want to emphasize the fact that surgery alone offers material aid to this class of sufferers, referring, of course, to those in whom the symptoms are relieved by support, and they should have the benefit of an operation as soon as the condition is known. The work should be complete in every detail, and may be recapitulated as follows:

- (1) Suture of liver and kidney.
- (2) Shortening of gastrohepatic omentum.
- (3) Fixation transverse colon.
- (4) General reconstruction of the abdominal wall.

I want to thank Drs. Wolfstein and Carothers for valuable assistance rendered.

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ABDOMINAL CONTUSIONS ASSOCIATED WITH RUPTURE OF THE INTESTINE.

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IN 1887, Dr. B. Farquhar Curtis presented very fully and very interestingly the subject of contusions of the abdomen, with rupture of the intestine. His experiments upon the cadaver in relation to the mechanical causation of intestinal rupture led him to the conclusion "that the intestine is ruptured by being crushed between the contusing body and the bony parts, chiefly the vertebræ and pelvis, and that there are many chances in favor of the escape of the intestine from injury. There may be no gut lying directly at the point where the blow is inflicted; the gut may be partially inflated,—a condition which his experiments show diminishes the danger of rupture; or the gut may slip away from the pressure exercised by the blow." These conclusions represent substantially all that we know now of the mechanical causation of these injuries. From a very thorough and careful consideration of 116 cases studied with reference to their clinical and pathological aspects, he drew the following conclusions:

"(1) The treatment of contusions of the abdomen should be purely expectant in the early stages, until symptoms of internal injury have appeared, or until the full extent of the time in which they may be expected has passed. Explorative laparotomy at this time is inadmissible.

"(2) When symptoms of uncontrollable internal hæmorrhage or serious visceral injury appear, laparotomy is indicated; but when the diagnosis is uncertain, the operation should always be begun as an exploration.

“(3) Great collapse is an absolute contraindication to all operative interference.

“(4) When rupture of the intestine is found, the best method of treatment is to secure the injured gut to the abdominal wound, and form an artificial anus. This can be easily relieved by a later operation, when the patient has recovered his strength.”

Of his 116 cases, not one had been operated on, and his conclusions were therefore based chiefly on theoretical grounds. During the last fourteen years, practical experience with the results of operation has been sufficiently large to make it worthwhile, I think, to review the subject again in the light of more modern surgical methods, and to see how far these conclusions may require amendment. I have collected the records of eighty-five cases reported since 1887, and will compare very briefly the clinical and pathological features presented in these cases with the results obtained by Curtis.

Causation.—In seventy-five, the injury was the result of direct violence, and in thirty-two of these was due to a kick by horse or man. In nineteen it was caused by a fall, and in six by a piece of wood thrown from a circular saw. In only nine was it the result of a crushing force, and in one the cause is not stated. As in Curtis's cases, the most common cause is a kick; and if to these we add the cases due to pieces of wood flying from a circular saw and those resulting from being struck with pieces of iron or wood or from running against a sharp point, like a carriage-pole, we find ourselves in entire accord with his conclusions, that the great velocity and small area of striking surface are the dangerous elements in these injuries. The presence of these factors in the history of an accident makes rupture of the intestine very much to be feared. Crushing forces play a small part in the study of uncomplicated intestinal rupture, because they are so often accompanied by serious injury to other viscera.

Location and Character of Lesion.—In seventy-nine cases, the location of the rupture is clearly defined; the duodenum was injured ten times; the jejunum twenty; the ileum forty-

two; and the large intestine but six. A somewhat larger proportion of injuries to the duodenum than occurred in Curtis' series, but the proportions of all are not materially different. It is clear that no part of the intestinal tract escapes the liability to injury, but that the large intestine is rather less likely to be implicated. This is due in part to its more protected position, but more especially, I think, to its stronger and thicker walls.

In nine cases there was more than one tear in the intestinal wall. In one case reported by Kopfstein, six ruptures were discovered and successfully closed. Multiple lesions are therefore common enough to make necessary a very thorough examination of the intestinal tract.

The lesion may be a very small one, or may extend entirely around the circumference of the gut. Its size and its exact location are, however, of little importance, because fæcal extravasation and peritoneal infection are almost certain to follow even a small perforation, and they are the factors which make these injuries so dangerous and important.

Complicating lacerations of the mesentery occurred in six of the eighty-five cases, or in 7 per cent. as against 16 per cent. in the cases collected by Curtis. They are important not only because of the resulting hæmorrhage, but also because of their bearing upon the viability of that portion of the gut which is supplied by the torn vessels. This factor must always be borne in mind,—control of hæmorrhage by suture is not sufficient unless collateral circulation can be clearly demonstrated; its absence makes resection imperative.

Prognosis.—Rupture of the intestine has been practically a fatal accident. Curtis's cases all died, and recovery must, in any event, throw much doubt on the probability of its existence. One case cited by Curtis shows what effort may be made by nature in throwing out limiting adhesions and isolating the perforation; and I have seen the same effort made in a case of strangulated hernia which was returned into the abdominal cavity. The strangulated gut was not viable; limiting adhesions were formed; a localized abscess cavity

appeared communicating directly with afferent and efferent openings in the bowels, and the patient survived several weeks. It is conceivable that under some circumstances, as where the perforation and its resulting abscess lay in contact with the abdominal wall, an external opening might be established and the faecal fistula closed spontaneously; but I do not know of any such case having been recorded. Unless the rupture can be closed at once or made partially harmless by being brought into an abdominal opening and then subsequently closed, there can be but one outcome. Of the eighty-five cases which I have collected occurring since 1887, forty-five were not operated on and died; forty were operated on, with seventeen recoveries,— $42\frac{1}{2}$ per cent. I think it fair to assume that the unsuccessful results are less likely to be reported, so that this percentage is probably higher than would be true if all the cases had been available, but it is certainly full of encouragement.

Of the seventeen successful operations, in three the patients were under twenty years of age; in seven, between twenty and thirty; in three, between forty and fifty; in two, between fifty and sixty; while in two the age was not given. Of the unsuccessful operations, five were under twenty; eighteen between twenty and thirty; six between thirty and forty; five between forty and fifty; two between fifty and sixty; and in four the age was not stated. From a comparison of these figures it would seem that age is a comparatively insignificant factor in determining the result. Of twenty-nine cases in which the operation was performed within twenty-four hours after the accident, thirteen recovered; and of four done within the next forty-eight hours, two were successful. One case which was operated on the fourth day recovered, and in one the interval between accident and operation is not stated. Early operation is therefore essential to success, but, as the records show that five cases died within an hour after the operation, caution must be exercised not to interfere unless the patient shows evidence of being able to rally from the shock of the accident. Imposing the shock of an operation upon a man already in collapse is rarely to be advised. A more general

use of saline infusions to prevent and counteract shock will, however, largely diminish the necessity for delay.

In studying the location of the rupture and its relation to the result, we find that the small intestine was injured seventy-four times, with fifteen recoveries; and the large intestine eleven times, with two recoveries, about one-fifth of each. Of the seventeen successful operations, six were for closure of rents in the ileum; two for closure of tears in the jejunum; one for rupture of the duodenum; and in six the small intestine only is designated. In three instances the ruptures were multiple. The location of the rupture, therefore, provided it is accessible and found, would seem to make little difference in the probability of recovery.

We may safely infer from these figures that traumatic rupture of the intestine is no longer necessarily fatal, and that early operation—due consideration being made for the presence of shock—offers a very fair prospect of success when the opening can be found and closed.

Symptomatology.—Analysis of the reported cases discloses a great variety of symptoms and a wide difference in the time of their development. In many instances the injury is immediately followed by symptoms suggesting at once its nature and its gravity. Of the forty-five cases which died without operation, eighteen, or 40 per cent., survived less than twenty-four hours. In one case, however, it is stated that a man continued to work after receiving a kick in the abdomen at 4 P.M.; felt some pain in the night, but no marked trouble until next morning. He died thirty-three hours after the accident, and at the autopsy there was an extravasation of blood and faecal matter in the peritoneal cavity from extensive injury to the ascending colon. Curtis mentions two cases in which the symptoms were delayed twenty and twenty-six hours, respectively. In the majority of cases, however, the patient's condition is suggestive from the moment of the injury. The prominent symptoms which appear in most of the cases are shock, abdominal pain, vomiting, and rigidity of the abdominal muscles. The presence of all of these within the

first few hours after the accident would make the early diagnosis easy, but unfortunately few cases present so typical a picture. Reasoning from our knowledge of other acute abdominal affections, I should regard muscular rigidity as the most important symptom of all, particularly if it were definitely localized; its association with shock or abdominal pain would, I think, be presumptive evidence of severe internal injury. But, after all, we must acknowledge that we have no positive signs that can always be depended upon for an early diagnosis. It must be the picture as a whole that we must most often look to in forming our opinion, and in that picture I believe the nature of the accident and, as I have quoted before, the velocity and area of striking surface are important factors. The later symptoms are simply those of perforative peritonitis, with no distinctive characteristics, and require no further consideration here.

The most difficult problem connected with these cases is to determine when the intestine is injured and when it is not. Often it is probably impossible to know without exploratory incision, and always one's own personal experience enters so largely into one's opinions with reference to a question like this that I will be pardoned, I trust, if I relate briefly the history of four cases of my own in this connection.

CASE I.—Male, twenty-two years old; entered City Hospital October 4, 1893. Seven hours before he had been kicked by a horse on the abdomen. There was no external mark, no shock, but there was constant nausea and vomiting, with severe abdominal pain, most acute to the left of median line half-way between umbilicus and pubes. On the following day temperature was 101° F., pulse 120, pain continued, though not so severe. On the second day symptoms of general peritonitis, pain, tenderness, distention, continuance of vomiting, no passage of wind or feces from rectum, led to operation as a last resort. The intestines were universally adherent, covered with patches of coagulated lymph, and several ounces of foetid pus were removed by separating the adhesions. No perforation was found. He died forty-eight hours later, and at autopsy two perforations, each a little

more than one inch in diameter, were found in the lower portion of the ileum.

The operation was undertaken too late, and was incomplete. I had not then the courage nor the familiarity with the emergency surgery of the abdomen to cope successfully with such an injury. Last resort surgery is generally unsuccessful, always unsatisfactory, because, even if the patient survives, one cannot but appreciate what an immensely increased risk has been incurred by delay. The absence of shock would have made operation possible within ten hours after the accident, and a careful search would have readily disclosed the perforations; the chances of success would then have been immensely greater.

CASE II.—Male, thirty-two years old; was seen in consultation with Dr. C. H. Perry on April 10, 1894. On the previous afternoon he was struck on the abdomen by a piece of wood thrown from a circular saw making several hundred revolutions a minute. When seen one hour after the accident there was little shock and no collapse; pulse full, strong, and natural; pain was intense from the first, and the abdomen was very sensitive; no vomiting after the first hour. When I saw him the next day temperature was 102° F., pulse 120. The abdomen was tender on pressure, not distended, but very hard, muscles in full contraction. On opening the peritoneum, there was an immediate escape of turbid serum containing particles of fæces, and on separating the adherent intestines an opening was found in the ileum involving about one-third of its circumference, and situated just to the left of the umbilicus, at a point corresponding very closely to the point of maximum tenderness. The opening was closed with a double row of Lembert sutures, and the abdomen irrigated with sterile water. The patient survived the operation thirty hours.

CASE III.—Male, fifty-seven years old. On March 21, 1900, at 1 P.M., was struck on abdomen by a board thrown from circular saw; was driven to the hospital and walked into the accident room; complained of severe abdominal pain, which was somewhat relieved by strapping, and he returned at once to his home, walking into the house from his carriage. During the night his pain became much more severe; there was localized tenderness and

rigidity on the right side of the abdomen; his temperature was 102° F., pulse 130; vomiting began about twelve hours after the accident. I saw him at 11 A.M., with Dr. R. W. Greene, and advised his immediate removal to the hospital. About twenty-six hours after the accident I opened the abdomen in the right linea semilunaris. There was immediate discharge of liquid and solid faecal matter, the intestines were covered with coagulated lymph, and were lightly adherent. An opening two and a half centimetres in diameter was found in the lower part of the ileum, opposite the mesenteric border. It was closed with a purse-string suture, and the abdomen thoroughly flushed out. Not feeling perfectly sure about my suture, and not daring to occupy any more time on account of the patient's condition, I brought the sutured bowel directly under my incision, and packed around it loosely with iodoform gauze. No sign of peritonitis followed the operation, but in four days a faecal fistula was established, which was closed by a subsequent operation, and the recovery has been complete.

CASE IV.—Male, thirty-one years old; was seen at the City Hospital June 26, 1900, in consultation with Dr. S. B. Woodward. The previous evening he was struck by a board flying from a circular saw exactly as in Cases II and III. He had vomited twice, and was in severe pain; abdomen was tender and everywhere rigid; pulse under 80, but respiration catchy and painful. He had been fairly comfortable during the morning, but became suddenly worse at three in the afternoon, and was immediately operated upon by Dr. Woodward, through whose courtesy I am allowed to report the case here. Gas and bile-stained fluid escaped from the abdominal cavity, and a longitudinal rupture two and a half centimetres long was found in the ileum. This was carefully sutured, and the abdomen thoroughly washed out; but the patient died about fifty hours later, with symptoms of general peritoneal infection.

In studying these cases with reference to the indications of intestinal rupture, one is struck first with the similarity in the nature of the accident,—in all a small striking surface, combined with great velocity. Rupture may occur as the result of falls or of crushing forces, but, as we have seen, these are less common. A kick or hard blow with a comparatively sharp

instrument should always suggest the probability of internal injury, and these conditions are so perfectly fulfilled in the circular-saw accidents, as well as in the kicks received from animals, that they should, I think, be important factors in making an early diagnosis. The next feature of these cases to attract attention is the absence of severe shock in all. Curtis found it present in 80 per cent. of his cases; but it is mentioned in less than half of those which I have been able to collect (thirty-six out of the eighty-five); and from my own experience certainly little reliance can be placed upon it as an indication of serious injury to the gut. Its absence is surely of little significance. In all of my own cases, abdominal pain has been the most prominent of the early symptoms and the most persistent. Curtis found it absent in but nine of his 104 cases, and in six of those it developed after a few hours, while in 89 per cent. it is recorded as severe from the outset. When accompanied, as it was in the four cases just reported, by rigidity, local or general, of the abdominal muscles, it is of especial significance. The importance of the association of these two symptoms is now fully recognized in establishing the diagnosis of acute appendicitis, of perforation occurring during typhoid fever, and other acute abdominal affections. Their presence after a severe abdominal contusion should, I think, make the diagnosis of intestinal rupture more than probable.

Treatment.—I have already indicated clearly, I think, that the only chance for the successful treatment of these cases lies in an early operation. Without operation they are practically all fatal. I have also pointed out as well as I could the conditions and symptoms which, following a contusion of the abdomen, should lead one to suspect intestinal rupture. The surgeon's duty in these cases is plain. But we should go further, I think, and act more in accordance with the old rule in regard to strangulated hernia, viz., when in doubt, operate. In other words, if, after taking into consideration the manner in which the injury was inflicted, the amount and nature of the force applied, and the results of a careful physical examination, one

is not reasonably certain that there has been no injury to the underlying gut, an exploratory incision should be made and all doubt removed at once. For example, so much impressed have I been with the serious results following injuries inflicted by pieces of wood thrown from a rapidly revolving circular saw against the abdomen, that such an accident would lead me to open and thoroughly examine the peritoneal cavity if the clinical symptoms even suggested the possibility of rupture. Should its contents be uninjured, I believe no harm can be done, and the advantage of such a course would, in the great majority of cases, far outweigh any temporary inconvenience in the very few instances in which it would have been found to have been unnecessary. A coil of strangulated bowel is often viable after many hours of close constriction, but a peritonitis once started by extravasation can rarely be stopped; so that I believe that the old rule to operate when in doubt applies with even more force to the latter condition than to the former.

Operate then and operate early, should be the rule whenever an intestinal rupture is suspected. All experience is a witness to the danger of delay and the hopelessness of last resort surgery. But one word of caution is necessary, and that is, to note carefully the presence or absence of severe primary shock; and when present to take immediate measures to counteract it as far as possible. Large enemata of salt solution may favor fecal extravasation, and should be avoided, but intravenous or subcutaneous infusions should be promptly and freely given. As soon as reaction is fully established, an incision should be made, and the site of the incision should be over the point where the blow was inflicted, whenever it is possible to locate that point by the appearance of the abdominal wall or by the presence of localized pain or tenderness. The incision should be sufficiently long to permit of a thorough exposure and inspection of the underlying intestinal coils before their relations are in any wise disturbed. The injury is likely to be apparent at once, and the injured bowel should be promptly withdrawn from the peritoneal cavity, to prevent its further contamination, after carefully wiping up any fecal matter that

may have already escaped from the opening. If there were any hæmorrhage from wounded mesentery, that should be secured first. I would then close the intestinal wounds which were disclosed by the first inspection, later examine thoroughly the rest of the intestinal tract, and finally wash out the peritoneal cavity with salt solution just preparatory to closing the abdominal incision.

In closing the intestinal openings, a double layer of Lembert or mattress sutures is sufficient, except the wound involves one-half or more of the circumference of the bowels or when multiple openings are present in close proximity to each other. Under such circumstances resection may be necessary. I should, however, be inclined to take considerable chances with the lesser procedure. In closing the abdominal incision, one has to decide whether or not any communication shall be left with the sutured intestines. If the edge of the rupture has been carefully and tightly closed, so that one has no fear of further leakage, I do not believe simple peritoneal drainage to be necessary or useful, because it cannot be made effective. When, however, for any reason, as in my own successful case, one is not fully satisfied with the condition of the intestinal sutures and cannot make them satisfactory, they should be walled off from the rest of the peritoneal cavity, and left accessible to future inspection. In the majority of cases, however, I think it will be as safe, and will greatly add to the comfort and speed of convalescence, to close the abdominal incision at once.

Prompt recognition of the probability of visceral injury, exploratory incision, and the immediate repair of any wounds found in intestine or mesentery are, I think, the steps which, if carefully, intelligently taken, will enable any one who has the curiosity to look over the records of these accidents during the next fifteen years to report a much more brilliant series of results.

TRAUMATIC RUPTURE OF THE MESENTERIC ARTERIES.

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THE following case of rupture of the mesenteric arteries possesses great interest both from a scientific and medicolegal aspect. Such an accident seems singularly unique, since search through medical literature fails to reveal a single similar case.

In the interest of the Accident Department of the Ætna Life Insurance Company, on the afternoon of the 26th of February, 1901, I visited F. S., a commercial traveller, aged fifty-three years, who seven days previously had fallen on the sidewalk and fractured both bones of the right leg.

For the following history of the accident and the events preceding my visit, I am indebted to the courtesy of Dr. Long, the attending physician:

The injured man was over six feet tall, weighing about two hundred and forty pounds; and, although but fifty-three years of age, he was very gray, and looked to be sixty, at least. He was a temperate man of some bodily vigor. His young wife was not yet out of an accouchement, the fruit of which was a pair of healthy twins.

On the evening of February 19 he slipped and fell on the sidewalk, coming down with great force and doubling his right leg underneath him. He was taken to the Kennard Hotel, where he was stopping. Dr. Long was immediately summoned, and found Mr. S. had suffered a fracture of both bones of the right leg. There was little displacement, and since reduction was easy,

no anæsthetic was required. Some symptoms of shock were noticed that night; the pain was slight at the seat of fracture, but considerable swelling was manifested. There was no pain complained of in any other part of the body. On the following day the patient seemed weak, but was easy and cheerful; he complained of no pain, rested well, and took considerable nourishment; temperature, 99.5° F.; pulse, 99. The urine was scanty, but contained no abnormal constituents.

On the 21st his temperature registered 100° F., which was the highest point reached at any time during his illness; his pulse was 95; he appeared quite weak, but took considerable nourishment, complained of no pain, and the bowels moved from the stimulus of an enema.

On the 23d he vomited, complained of faintness, seemed to be very weak; pulse 100 and weak; temperature, 97.5° F. Consultation was had both on the 24th and 25th with Drs. Wait, House, and Bunts. Latent shock, internal hæmorrhage, and cerebral embolism were carefully considered, and no definite conclusion reached.

When I visited him on the 26th, I found the fractured limb in good condition, swelling largely disappeared, no blistering of the skin, or evidences to indicate other than that the fracture was doing nicely. He was extremely pallid, semiconscious, bathed in a profuse cold perspiration, breathing irregularly, pulse 160, temperature subnormal, even and tightly contracted pupils, but presenting no evidence of paralysis of any part of the body. His bowels had spontaneously moved twice that day. He had been catheterized, and a small quantity of normal urine withdrawn, whose specific gravity, however, was quite high. There was some slight distention of the abdomen, careful percussion of which revealed no localized dulness nor undue resonance. The man was evidently dying from an internal hæmorrhage, the source and location of which it was impossible to determine.

Mr. S. died that night, and the body was taken to Detroit, where a post mortem was made by Drs. George Duffield and Hennage Gibbs, through whose courtesy I have the privilege to follow this interesting case.

The fracture was found to be in excellent condition. The heart and thoracic organs were fairly normal, although the former showed some degeneration. When the abdomen was opened, they

found quite a quantity of blood, the source of which was found to be from the fractured walls of several of the mesenteric arteries. The mesentery contained an enormous amount of fat; and it is not hard to understand that the tremendous tug exerted upon this structure by the violent fall upon the buttocks was sufficient to lacerate the mesentery and produce hæmorrhage.

The slow development of the symptoms resulting in death one week following his injury is most remarkable, and from our search of the literature on the subject we believe is unique.

Drs. Duffield and Gibbs are unquestionably right in ascribing the tardy development of the symptoms of collapse to slow hæmorrhage and the rapid absorption of the blood by the peritoneum. It is also quite certain that the vessel walls were not in normal condition, else the natural processes of nature would have closed their ruptured walls and recovery ensued.

THE SURGICAL TREATMENT OF SOME OF THE
REMOTE RESULTS OF INFLAMMATION
OF THE GALL-BLADDER AND
BILE-DUCTS.¹

By HARRY DORR NILES, M.D.,

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SURGEON TO THE HOLY CROSS HOSPITAL.

WHERE the presence of gall-stones is demonstrated by the characteristic paroxysms of pain, and the distress and immediate danger of our patient stimulate us to decide and act promptly, few of us are in doubt as to the only treatment that promises relief. But the presence of gall-stones is not always the essential, and is perhaps never the primary, cause of inflammation of these parts; nor are gall-stone seizures the only indication for surgery in this region.

The immediate and remote results and symptoms of infection here do not materially differ from those of infection in the Fallopian tube or appendix, except as modified by the anatomical relations or physiological functions of the adjacent organs and tissues. In salpingitis and appendicitis the infection is completely shut off from drainage by natural barriers, and the distress and systemic infection are more acute and constant than in cholangitis, where, unless obstructed, the natural channels afford some drainage. Hence it follows that acute attacks of salpingitis and appendicitis are now recognized promptly, while a considerable amount of pathology may exist in and about the gall-bladder and bile-ducts, with adhesions involving the nearby organs, and yet the patient be unable to give any definite history pointing to any acute inflammation in this region.

¹ Read before the Idaho State Society, October 4, 1901.

Moreover the resulting adhesions may produce symptoms that overshadow or quite obscure those associated with the original disease in the gall-bladder, and perhaps lead to false conclusions in our diagnosis and to mistaken ideas of treatment.

The surgery of the past few years has given operators many opportunities for studying these pathological processes, and helped us to correct many old-time errors, and suggested, in the minds of all thoughtful observers, a new conception of the important rôle these parts are likely to play in the abdominal surgery of the future. In this connection, I trust that the notes of the following cases will be of some interest.

CASE I.—*Chronic Colitis produced by Partial Occlusion of Colon at Its Hepatic Curvature by Old Adhesions to the Liver and Gall-bladder.*

Mr. D., aged fifty-nine; occupation, mine owner; first seen June, 1901. Complained at that time of uneasiness amounting to considerable distress, at times extending over the whole abdomen. The pain, at irregular intervals, varying from a week to a month, incapacitated him for days. This misery never localized, and was attributed by him to gaseous distention of the stomach and bowels. The more severe attacks were accompanied by nausea and vomiting. For twenty-four years he had suffered from these symptoms. During this time he had sought the advice of many able men both in this country and abroad, and nearly all kinds of treatment had been tried without success. From the account given by the patient, I inferred that the majority of his advisers thought him to be suffering from atonic dilatation of the stomach; and at first I concurred in this opinion, and only changed it after a thorough investigation proved the stomach to be free from disease and not dilated.

I kept him under observation some time, subjecting one organ after another to rigid and repeated examinations with the following results: The blood count showed a moderate leucocytosis; the heart, lungs, and kidneys were normal; several analyses of the stomach contents and a measurement of the size of the stomach revealed nothing abnormal; the distention was nearly limited to the large intestine, and he passed large quantities of mucus. The right lobe of the liver extended below the lower border of the

ribs two finger-breadths. There was a slight conjunctival jaundice at times; a slight resistance and some tenderness upon pressure in the vicinity of the gall-bladder. At times he experienced terrific attacks of pain in his lower extremities resembling those of locomotor ataxia.

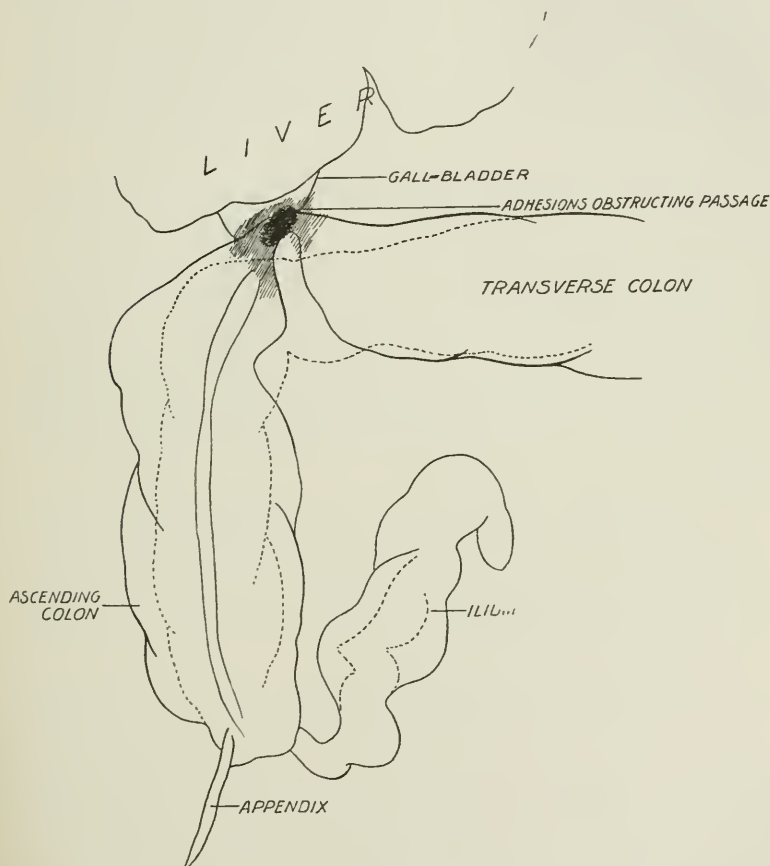


FIG. 1.—Diagram showing how a stricture was formed about the colon in Case I.

Occasionally, without any apparent cause, he would have chilly sensations followed by a slight temperature. This sign of infection, the jaundice, the leucocytosis, the tenderness over the gall-bladder, presence of bile in the urine, as well as the possibility of excluding other diseases, led me to suspect inflammation of the

gall-bladder with adhesions. I operated October, 1901, and found the gall-bladder adherent to the colon at its hepatic curvature, one band completely encircling the colon and nearly occluding it; this doubtless accounted for the catarrh and distention. These adhesions were broken up as far as seemed quite safe, about sixty small stones removed from the gall-bladder, and the latter drained for two weeks. The patient made a good recovery, and has been relieved of most of his symptoms; but there is still some distention occasionally, which is doubtless due to some very strong adhesions to the colon which, at the time, I thought best not to disturb, but which I believe now should have been severed.

CASE II.—*Chronic Inflammation of Gall-bladder in which the Mild Systemic Infection produced the most Distressing as well as the most Prominent Symptoms.*

Mr. H., aged thirty-six, occupation lawyer, gives a history of having at long intervals brief attacks of severe pain at the pit of the stomach for some years. But he had been free from these attacks for a long time, and the symptoms, on account of which he consulted me, and which incapacitated him for his professional duties, seemed at first to have no connection with his previous ailment.

An unusually strong, robust man of excellent habits, he had for some months suffered from constant headache and frequent flushings of the face, accompanied by mental dulness, physical weakness, giddiness, and nausea. There was no jaundice except a scarcely perceptible discoloration of the conjunctiva. Occasionally he suffered from abdominal distress which he thought was due to indigestion. All these symptoms were greatly aggravated at the time I first examined him. The case was sufficiently obscure to induce me to employ all available means of investigation before advising operative measures; but reasoning partly by excluding other diseases and partly by attaching considerable significance to the history of attacks of pain, I concluded the pathology would be found in the gall-bladder. This view was confirmed at the operation, when about seventy-five fair sized stones and one immense stone were removed. The latter was wedged into the neck of the bladder in such a position as to cut off all communication between the gall-bladder and the common duct, thus imprisoning the smaller stones as well as the infection. Hence the indications of mild systemic infection pre-

dominated over the usual characteristic local symptoms. The patient made a good recovery, and was in his office within four weeks.

CASE III.—*An Old Cholangitis with Adhesions to Duodenum producing Symptoms resembling those of Cancer of the Stomach.*

Mr. M., aged sixty, civil engineer. First seen April 25, 1901. Present trouble commenced four years ago with attacks of pain in the back and abdomen. These occurred at long intervals at first, but very frequently lately, and within the past year he has

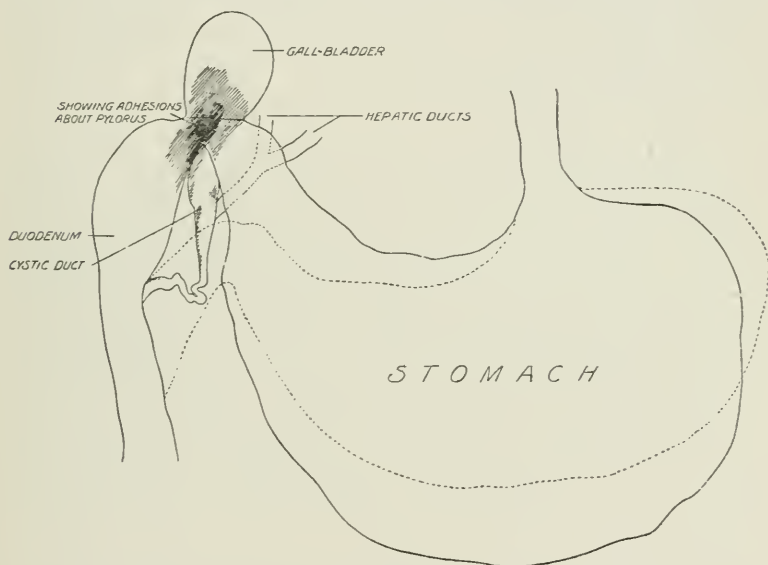


FIG. 2.—Diagram illustrating conditions found in Case III.

become very weak and emaciated, and suffers almost constantly from indigestion, gastric distress, nausea, and often vomits large quantities of coffee-ground material. His severest pain comes on usually about three hours after eating. Lifting the right arm produces distress in the stomach. Examination of stomach contents after a test breakfast, negative. The stomach and colon mopped out after being artificially distended showed the latter to be normal in size and position, and the former was dilated to quite four times its natural size, extending as low as two inches below the umbilicus. On palpation no distinct tumor could be

made out, though there seemed to be more resistance and muscular rigidity in the right upper quadrant than in the left, and percussion showed a slightly increased hepatic dulness.

There was evidently an obstruction at the pylorus, which, I am sure, five years ago we all, in view of the other symptoms, would have pronounced malignant.

An incision over the gall-bladder, made May 1, revealed the cause of the obstruction to be strong bands of adhesion constricting the pylorus and drawing it up against the gall-bladder and liver. These were separated and the patient made a good recovery, though he still suffers from some of the symptoms due to the dilatation of the stomach, and it will doubtless be a long time before he is perfectly well.

CASE IV.—*Symptoms of Ulcer of the Stomach produced by Gall-bladder Adhesions.*

Miss B., aged twenty-three; first seen July 25, 1901. During the past year this patient has had more or less constant distress in different parts of the abdomen, with an occasional acute attack of severe pain apparently in the stomach, accompanied by nausea and the vomiting of small quantities of blood. For some time she has been losing flesh and strength, and for some months she has had an evening temperature of 100° to 101.6° F. Digestion poor. These symptoms, in some respects, pointed strongly to tubercular ulcer of the stomach, and I am sure that, unguided by my recent experiences, that would have been my diagnosis. In this instance, however, we were influenced to regard inflammation of the gall-bladder and bile-ducts as the primary disease, and the localized gastritis secondary, from the history of the successive symptoms, and from the fact that, through all her sickness, the point of greatest tenderness remained in the right upper quadrant and somewhat diffused. Upon exploring the parts suspected of being diseased, the gall-bladder was found completely surrounded by the omentum, to which it was firmly adherent. These dense adhesions were separated so far as was deemed prudent, and the gall-bladder drained. Thus far the patient has been entirely free from her old pains, and her temperature has remained normal after the first twenty-four hours.

These and other experiences and observations in the same line lead me to conclude, *First*, in this region inflammatory

lesions often occur and produce permanent organic changes without giving rise to those characteristic signs and symptoms described in our text-books. *Second*, that the anatomical relations and physiological functions of the surrounding organs and tissues are such that peritoneal adhesions here may produce grave secondary lesions and symptoms, that in the past we all have failed to recognize or, at least, to correctly interpret. *Third*, in these obscure cases we are often compelled to resort to an exploratory incision to determine the exact condition, and to rely exclusively upon surgical measures to remove or correct the pathology. *Fourth*, in the light of our present knowledge, no experienced surgeon is justified in hastily deciding these cases are hopeless or in permitting them to be deluded by a foolish faith in drugs or other unreasonable measures; it is his duty to offer them such chances as modern surgery affords so far as his ability and the conditions permit. Guided by my recent studies and personal experience, I shall in the future be, if possible, more thorough and radical in separating all adhesions, and in taking every precaution to prevent their reforming. In closing this paper, I desire to gratefully acknowledge my indebtedness to Dr. A. A. Kerr, who has been associated with me in all these cases as well as in other investigations and studies in the same lines.

AN INSTRUMENT FOR FACILITATING INTESTINAL ANASTOMOSIS.

By OSCAR H. ALLIS, M.D.,

OF PHILADELPHIA,

SURGEON TO THE PRESBYTERIAN HOSPITAL.

My first intestinal anastomosis was with the Murphy button. With its magic assistance I united the small intestine to the stomach to overcome pyloric obstruction. As the button was not subsequently found in the stools, the blame was visited upon the attending nurse. A year or more later it was found at the autopsy in the stomach.

In my second employment of the button for fæcal fistula, the walls of the intestines to be approximated were thick and infiltrated and unsuited to the buttons in ordinary use. I did the best I could with the button, but the thickened walls held it a prisoner and would not let it pass on. The result was a second fistula at the point of operation. In due time I cut down and removed the button. Several months later I again attempted to close the fistulous orifice. I had to resect the gut, and when I had done this, I found the spring out of order in the button that I had depended on for my closure of the parts. Left to my own resources, I was obliged to unite the severed gut-ends as best I could. The result was satisfactory, and since then I have depended on no other instruments than those described in the present communication.

I think that surgeons, after a little experience in anastomoses, rely more confidently upon their fingers and simple forceps and the suture than upon any of the appliances that have been specially contrived for the work, and the reason is obvious. No single instrument and no series of instruments

¹ Read before the Philadelphia Academy of Surgery, November 4, 1901.

can meet all the requirements; and it not infrequently happens that an anastomosis is demanded when none of his kit

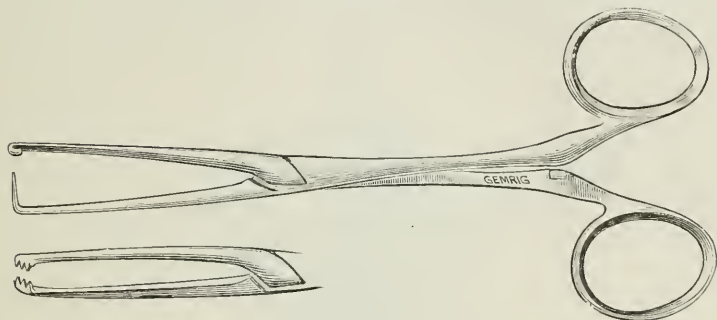


FIG. 1.—The tenaculum or basting forceps above; below are the rat-tooth forceps. By a misunderstanding, the teeth are placed at the end instead of at the side.

of special instruments is at hand. Such, at least, has been my experience.

If one notice a tailor at his work, he will observe that before he takes a single stitch he prepares his work by basting it. The surgeon in his anastomotic work needs to do basting

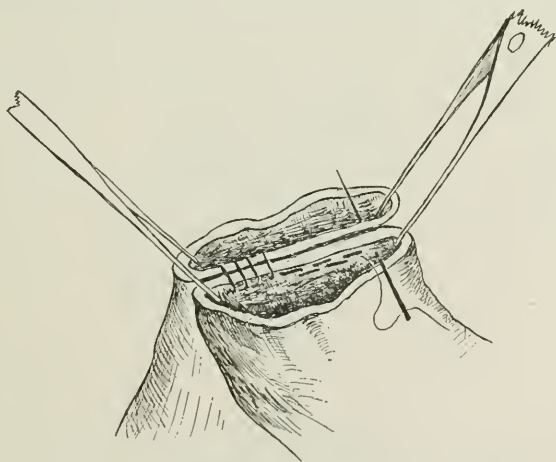


FIG. 2.—The first attachment of the tenaculum forceps holding the separated gut-ends for suturing.

more than in any other part of the body. This is done to some extent by the Murphy button. The Laplace and O'Hara

instruments are convenient forms of basting while the surgeon secures the approximate parts with suture.

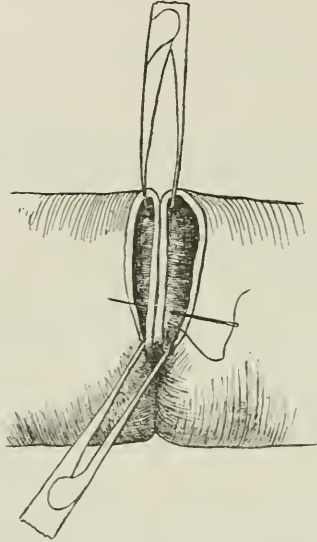


FIG. 3.—Advanced stage of suturing, *i.e.*, Fig. 2 advanced farther towards completion, suturing still the same as in Fig. 2.

The first instrument that I describe is my basting forceps. They will probably be known as tenaculum forceps, since the end of one blade is a tenaculum concealed in the loop of the

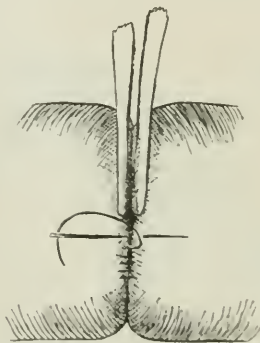


FIG. 4.—Final steps in closing the bowel. Figs. 2, 3, and 4 form a series.

other blade. These instruments will be found very serviceable in many minor operations. They make excellent retractors.

I have often found them of great service in securing a piece of protective along the cut edge of the wound with a view to protecting the field of operation. In operating for varicocele (open method) I secured a clean piece of muslin to the edge

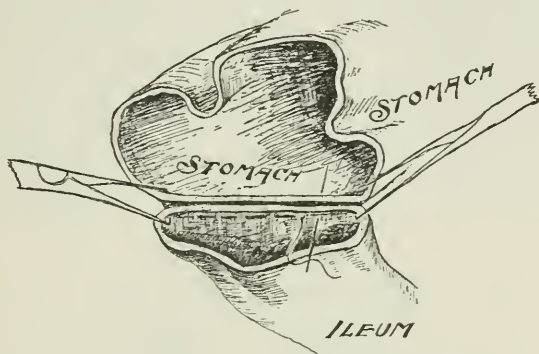


FIG. 5.—The small ileum is represented as being sutured to the stomach—end to end—suturing through and through.

of the wound, and thus shut the penis, scrotum, and pubes from the field.

In using these instruments on an ordinary anastomosis, I seize the parts that I wish to unite and bring their serous sur-

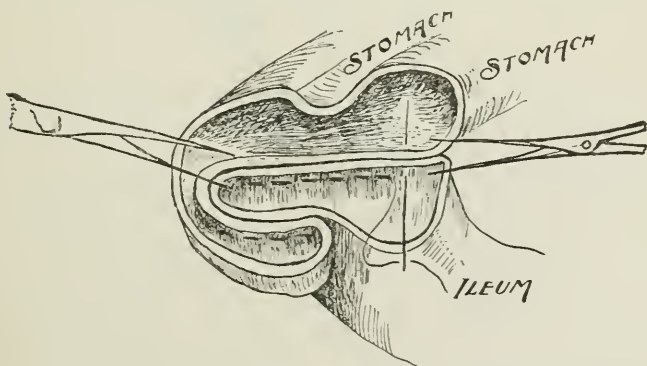


FIG. 6.—Advanced stage of Fig. 5. The tenaculum forceps holds the parts for easy suturing, which is through and through.

faces together, just as one would bring the two ends of his coat-sleeves together by placing them side by side. Having transfixed them as shown in Fig. 2, I begin my suturing, sewing through and through or over and over. The kind of

suture employed is immaterial, provided only that it transfixes both walls. The gut being clasped as in the figure, fully half the circumference of the gut-ends can be closed. I now take off the forceps on the left (Fig. 2) and reclamp them where the suturing terminated; taking off the forceps on the right, I can reattach them still farther to the right, basting more gut surface for the permanent suturing (Fig. 3). In this way ordinarily fully two-thirds of the circumference of the gut can be sutured from *within the gut*. Indeed, it is possible to entirely unite two divided gut surfaces by end-to-end suturing,

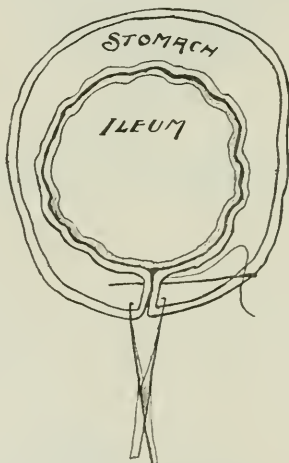


FIG. 7.—The suturing in Fig. 6 has finally united the whole circumference of the ileum to the stomach, and the needle has begun to close the remaining part of the stomach.

with every suture starting from the mucous surface. The advantage, however, would be very little over a *serous* suture, and the disadvantage of delay will be something.

The final closing of the gut-ends will be very conveniently done by means of a pair of forceps with teeth on the sides. By means of these the border of the gut can be seized and inverted, after which both forceps can be held in the left hand while the right is suturing (Fig. 5). At a glance the amount of suturing from *within the gut*—fully two-thirds can be seen—is made to perforate all the coats of the bowel. This secures enough tissue for a safe closure, and insures the passage of the suture into the lumen of the bowel.

I have never resected a part of the stomach and made an anastomosis between it and a part of the small bowel, but the following method, somewhat unusual, is entirely feasible. The two structures to be joined are brought together and basted by the forceps as in Fig. 6. This done, the forceps on the left are carried over to the point where the suturing ends and reclapsed, while the forceps to the right are made to clasp unsutured parts and hold them until sutured.

In the figure, the needle is supposed to enter at the point where the suturing ceased. The part between it and the for-

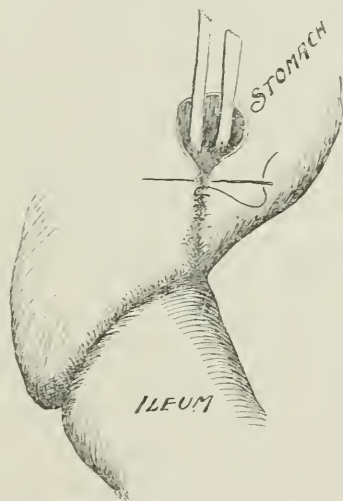


FIG. 8.—The entire circumference of the ileum has been attached to the stomach without a suture showing on the outside, and the remaining part is being turned in by the forceps, with teeth on the edge for convenient suturing. Figs. 5, 6, 7, and 8 form a series.

ceps on the right is still unsutured. Since the cut border of the stomach will in most instances be greater than that of the small intestine, it will be entirely practical to sew the two together as represented in Fig. 8. (Compare Figs. 7, 8, and 9.) Having sutured the small bowel to the stomach end-to-end, the remainder of the stomach approximation can be readily completed by means of the forceps (Fig. 5), which seize the borders and turn them in while the sutures are applied.

MISAPPLIED MECHANICAL SUPPORT TO WEAK ANKLES OF CHILDREN.¹

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THE vast majority of the human race who wear sandals or moccasins or go barefoot escape the tortures and malformations that follow the wearing of such shoes as those in use in our country at the present time; it would appear, therefore, that the shoe or kind of shoe is responsible for at least some of the disabilities of the foot and ankle. The shape of the sole of the shoe has received much attention from orthopedic surgeons, and reforms in some have been secured. It is the purpose of this paper to consider only weak ankles in childhood, and forms of mechanical compression and restraint commonly in use which are at variance with common sense.

The cases usually seen may be conveniently grouped as follows:

- (1) Undeveloped normal feet in normal bodies.
- (2) Normal feet in fat children.
- (3) Apparently normal feet in rhachitic children.

There appears to be a growing tendency to apply to all children's shoes some more or less rigid support in the form of high uppers, stiff leather counters, whalebone, and even arch-raisers of various materials. Many of these appliances are strongly advocated by shoemakers and by them applied; but not infrequently physicians prescribe their use, and add

¹ Read before the Philadelphia Academy of Surgery, November 4, 1901.

their testimonials to favor still further sale, and even textbooks are found which recommend them.

Given a case of an apparently normal child beginning to walk. It is natural that functions that have not been employed heretofore would be faultily performed. The muscles that have not been employed in this capacity are not capable of sustaining the weight of the body or of holding the arch up into its subsequent normal position; and the advocates of mechanical support accept these conditions as clearly indicating the necessity of holding the foot and ankle fixedly to avoid still further relaxation of muscles and ligaments until the child grows strong enough to dispense with support.

If this theory is correct, its application elsewhere would indicate that the proper treatment for muscular weakness in any part of the body would be rest induced by mechanical apparatus or by confinement to bed. Still further, fatigue, sprains, and muscle strains, likely to accompany or follow physical exertion such as in foot-ball, boat-races, and athletic sports, would be prevented by keeping the muscles in a state of inactivity in preparation for use. This sounds absurd, but it is not more so than the application of restraint to weak ankles and feet of infants about to walk.

All children are flat-footed because the muscles have not developed the arches of the foot, and use is required to bring the muscles into full development; proper development can only be obtained by perfect freedom from restraint.

Civilization is undoubtedly responsible for a vast array of ills and disabilities of the human frame, but nowhere is this more manifest than in the feet of young children. Those that escape the sole-leather-crippling apparatus are subjected to milder forms of restraint in the leather shoes with high uppers which, even if made of soft leather, must necessarily bind the ankle and foot, thereby preventing full function. The resulting sprains and faulty uses of the feet of children from six to ten years of age are a natural sequence. The faulty position and uses of the toes are often remarked. T. S. Ellis, in his monograph, "The Human Foot," says, "The toes play

a far more important part in the ordinary functions of the foot than is generally admitted. One sees statements (where better things might be expected) to the effect that their services could be dispensed with. If they were not used, the muscles moving them would be found to be wasted." It must be recognized that the absence of function is at first normal, and that the subsequent deformities are incidental to the customs of civilization, being confined to shoe-wearing people.

The softer the material of which the infant shoe, including the sole, is made, the less hinderance will there be to the normal development of the encased foot. The knitted sock or the Indian moccason is entirely free from objection and criticism; by their use the foot is protected from cold and is free for natural movement and development. The avoidance of prolonged weight-bearing, the avoidance of fatigue and muscle exhaustion, will enable the feet to properly and normally assume the strain of use. The fact, which is beyond dispute, viz., that the process of civilization deforms the feet and produces loss of proper mechanical functions, is clearly sufficient indication that the correct course to pursue is to avoid all restraint to full perfect function.

The most beautifully formed adult feet that I have seen have been in those who never, as child or adult, have worn shoes; they may have worn sandals which required the action of muscles to retain them in place, but this was in the line of correct use. In contrast, the most serious sprains of the ankle that I have seen in children have been in those who have had inadequate muscle and joint function. Careful inquiry has almost always elicited a history of weak ankles from early infancy and the use of high-counters or some such equally reprehensible and mechanical restraint to normal function. After the acute pain caused by the sprain has subsided, these cases require massage and carefully applied physical culture to develop the muscles and establish full function to prevent recurrence, in contrast to maintenance of immobilization previously employed.

The medical profession has accomplished many needful

reforms in fashions and customs by directing attention to their dangers. There appears to be a necessity for discouraging the use of the extensively advertised and too generally used so-called supporters for weak ankles, the use of which is not only irrational, but also decidedly harmful, and it is my conviction that they are never beneficial.

The routine plan alluded to, of applying restraint to normal infant feet, appears to have its basis in the fact that in some cases support or even rigidity may be necessary as a temporary expedient while remedial measures are carried out, but should be discontinued as quickly as possible. The cases that may require some form of mechanical support are those that are enfeebled or rhachitic. It must be accepted that in the cases just alluded to destructive changes may occur before muscular coördination can be established, and therefore support without rigidity is often required. The most convenient and efficient form of brace for this purpose is one that is constructed of sheet-steel with a movable joint at the ankle and which is placed within the shoe. The temporary use of this brace does not interfere with full muscular development of the foot, and yet it provides efficient lateral support. Whenever a joint is prevented from action, the muscles which actuate it become atrophied from disuse, and the longer the time that such rigidity is applied to a joint the greater is the disability.

In infants the feet are the most notable in their faulty mechanical use from their more exposed position; but in fact the knees and hips are, upon inspection, generally found to be equally undeveloped, and therefore faulty in action, but are never subjected to similar forms of rigid appliances. The mandate of fashion, however, dictates that the infant foot should be prepared for shoe wearing, and therefore the process is started early in life. When the unnatural foot covering is used in a way unsatisfactory to the trainers, when the little encased foot turns over on its side or becomes pigeon-toed, early recourse is had to the high-counter, corset-shoe, felt or steel arch-raiser, or wedging of the sole. The natural method

of removing the cause, *i.e.*, the shoe, appears to be considered objectionable for some unaccountable reason. Proof that removing the shoe is the best procedure can readily be found in the strong, active, correctly shaped feet of young children who have not worn shoes.

The methods pursued in the high-caste Chinese woman's foot should teach a lesson. The little girl was formerly, in many districts, allowed to run barefooted until the age of five years in order to develop the feet. At this age the deforming bandages were applied, and at the end of two years had permanently distorted the feet to an unrecognizable mass and rendered them permanently useless. The plan pursued by shoe-wearing people begins earlier, is slower in accomplishing the results, but the disfigurement and disability oftentimes differ only in degree.

The least objectionable shoe for young children is a low shoe or slipper which possesses the advantages of sandals. Nothing can be gained by the upper, which has the constant disadvantage of cramping the ankle, and thereby preventing its full free use and development. The serious disadvantages of the upper are greatly increased by the various methods of increasing its stiffness, by the addition of movable strips of sole leather on each side as in the pocket shoe, by strips of whalebone or steel as in the corset-shoe, by the high-counter, by the sole leather so-called weak-ankle supporter made independent of the shoe. All of these appliances by inhibiting joint motion naturally induce atrophy from disuse, and therefore make the ankle weaker and less capable of assuming normal functions.

The arch-raisers of steel, felt, or other material may make the appearance of an arch, but it is a faulty arch in that dependence upon this form of mechanical support increases with use, while the tie-rods upon which the arch normally depends are cramped out of usefulness and made to deteriorate by disuse.

The wedge-shaped sole is equally objectionable because its use merely overcomes the appearance of the feet turning

laterally, while in reality it hampers normal latitude of motion, and thereby aids muscle disuse.

The constriction of the rubber elastic anklet is without a single rational explanation based upon sound mechanical laws, and yet its use is very common. The strongest argument against the employment of these aids to permanent deformity and false mechanical use of the feet may be found in cases where entire freedom from restraint has obtained, and where physical culture has been relied upon to develop muscles and function. In these patients the ankles, as well as the knees, hips, and other joints, have been trained to their normal standard of use and function and rendered capable of sustaining extensive usage without injury. The wonderful recuperative power of the human being makes it possible to greatly interfere with its functions, and yet not show great deterioration, or even obtain a fair semblance of normal use. These cases that appear to recover by the use of appliances here referred to pay tribute to their own wonderful recuperative powers and not to the irrational means used to hinderance.

In that group of cases of weak ankles classed as rhachitic may be found the explanation of all the evils irrationally applied to really normal feet. In rhachitic children it often becomes necessary to apply aids to mechanical function not alone because of muscle insufficiency, but also on account of the lack of stability of the bones. Deformities of the feet are frequently associated with malformations of the long bones, such as the valgus foot and bow-legs and knock-knees, each depending more or less upon the other and upon the constitutional disease for their development.

No routine plan of treatment can be laid down, for discernment is required to meet the mechanical inefficiencies by mechanical aids that will be of benefit and not prove injurious. When some form of splinting becomes necessary care should be exercised in securing a freely movable joint to correspond with the ankle, thereby favoring proper usefulness of that joint without producing deformity. Internal medication, attention to hygiene, diet, guarded exercise, and similar measures

will facilitate establishment of normal function in enfeebled apparatus.

I would direct attention to the following conclusions:

The natural human foot best performs its functions when it has been freest from restraint.

The natural foot can be quickly crippled into inefficiency by high-counters, corset-shoes, arch-raisers, wedges, and elastic anklets.

The natural foot, when burdened by misapplied mechanics, is rendered weak, and therefore susceptible of sustaining injury, such as sprains and the formation of bunions, flat feet, wobble joints, etc.

The natural foot in a constitutionally weak or rhachitic child may demand mechanical aids specially adapted to the individual requirements and peculiarities of the case.

That it is the duty of the medical profession to discourage the indiscriminate use of high-counters, corset-shoes, elastic anklets, arch-raisers, and sole wedging, which are known to be injurious, unmechanical, and productive of permanent loss of function.

APPENDIX.

The following extracts from an advertisement recently received are illustrative of the absurd and unfounded statements of those who will sell their goods whether they produce injury or not.

Comment is unnecessary.

Children's ankle supporters. Will fit any shoe—button or lace. Especially adapted for children learning to walk. When ordering, please state the size of shoe usually worn.

The toe-in shoe. It is really surprising how many children need a shoe to prevent the awkward habit of toeing-in, and need it most just when they are beginning to walk; when, if our little "Toe-in" shoe is worn habitually, this tendency can easily be overcome, almost unconsciously, and wholly without discomfort or annoyance. It is a very simple device in the construction of the shoe, and, although so effective, is not noticeable except as attention is directed to it.

To prevent or cure bow-legs in children. The shoe to prevent or cure bow-legs has to do with a still more serious deformity, as, after the bones of a bowed leg are fairly hardened, nothing less than a surgical operation will afford a remedy. This shoe is so designed as to throw the weight of the body in a way to completely counteract the tendency of the legs to curve outward, and they straighten of themselves. There is nothing to attract attention—no conspicuous brace or bandage. We recommend their use as early as the child shows any inclination in this direction.

Ankle and arch supporting shoe. Our new shoe to strengthen weak ankles is the best thing of the kind we know of. It holds the ankle with a firm but gentle and yielding pressure; it also supports the arch of the foot, which in most cases is the real point of weakness, and the cause of turning ankles. It also effectually prevents flattening of the foot—one of the very worst of orthopedic evils.

Instep-arch supporters. A positive cure for flat feet. These supporters are extremely light in weight, can be easily worn in any shoe, and, owing to their flexibility, are far superior and vastly more comfortable than the old-fashioned rigid devices of steel and bronze employed to correct the above condition.

ELBOW FRACTURES IN CHILDREN.

FRACTURES OF THE LOWER END OF THE HUMERUS; LESIONS
AND END RESULTS, AND THEIR BEARING
UPON TREATMENT.

BY FREDERIC J. COTTON, M.D.,

OF BOSTON, MASS.

(Concluded from page 269.)

END RESULTS.

THE matter of rate of recovery—of the result at the time the case is discharged from the surgeon's care—is not, however, the most important item in the result. It is important only in so far as it is the cause of the vague and pessimistic prognosis often given in these cases.

What we really want (and ought) to know is not the result at six or twelve weeks, but the end result, the sort of arm the patient is to grow up with.

Time of recovery in the child is of very slight importance compared with end results.

Impressed with this idea, the writer has attempted to get at the end results by looking up the patients after the lapse of many months. The majority were found (twenty-seven out of the thirty-two fresh cases), and the outcome was rather striking. Even in cases in which the outlook at two to four months was very discouraging proved to have come out very well indeed.

For example, Case IV, and more especially Case X, may be cited: the change is obvious from the clinical histories.

In none of the cases looked up was there a trace of the "ankylosis" of which one reads so much, in no case any real disability; in nearly all the cases the arm, even without clothing, would pass casual inspection as normal.

On careful inspection, however, there was no difficulty in most of the cases in recognizing sequelæ of the fracture, something not to be desired either in regard to looks or motion. The writer has attempted to classify these different deformities and limitations of motion and to trace their connection with the original causes in the character of the lesion or in its treatment. Curiously enough, this seems never to have been done before in anything but a haphazard way. The cases available for this sort of comparison were obviously not a long series (thirty-two fresh cases), of which twenty-six were traced, and seven other cases seen only after union had taken place, but the results proved so definite that the conclusions drawn may fairly be accorded a greater weight than the number of cases would suggest.

GUNSTOCK DEFORMITY.

First as to deviation of the axis of the bone, especially the form described as cubitus varus, the so-called gunstock deformity of Allis. This was found in a marked degree in Cases XIX, XXII, XXIII, XXV, XXVII, and XXVIII. In these cases (as in the Cases XXXVI, XXXVII, XXXVIII, XXXIX, first seen after healing of the fracture) it was of the usual familiar type, conspicuous especially in the supinated extended position, lessened in flexion, and the characteristic apparent rotation of the arm in the motion of extension (a sort of screw twist) was constant.

In all these cases it will be noted that the original injury was *above* the elbow-joint, and not a fracture of either condyle.

In none of the other cases of the twenty-seven was there any deformity of this kind that reached more than a very slight degree.¹ In Case XVIII there was a slight varus, as also in XII, XVII, and XXVI. In this last case (an external condylar fracture) the other arm had also been fractured, so that it is impossible to say, considering the great normal varia-

¹ Nor did any appear in the cases treated and not found later, up to the time they were lost from view.

tion, how far this lessened angle is a result of the injury. In a number of the other cases there is a faint trace of the same deformity, a little lessening of the normal outward carrying angle in supination, but in none of these last was it evident until the tracings were carefully compared.

It would seem, then, that the gunstock deformity belongs rather to the fractures above the joint, in which it was present, out of a total of thirteen cases, in nine, of which five showed it in considerable degree.

All the cases definitely showing this deformity were, then, of the supracondylar class. The reverse deformity is apparent only in the slightest degree in Cases IV and XXI.

Of the varus cases, Case XXIII showed some limitation of motion which was decreasing when last seen; the interval between injury and examination in this case was somewhat less than that allowed the others, and apparently not enough to reach the actual end result.

In Cases XIX, XXV, and XXVII there was no restriction of motion, or practically none, and in XXVIII only a limitation of flexion amply explained by the projection forward of the lower end of the upper fragment. A like limitation from like cause in Case XXII.

There is, however, a second type of deformity, that of bony displacement or overgrowth at the seat of fracture.

Only in two cases, XXII and XXVIII, was there any notable displacement of fragments resulting in deformity apart from the gunstock; these were supracondylar fractures with backward displacement, leaving the lower end of the upper fragment markedly projecting forward.

In nine cases, however, there was definitely a projection outward of a bony process near the external condyle, though in but one case (Case VIII) could any widening of the condyles be made out accompanying this; the mass seen and felt was always definite and isolated, hard and immovable, and always situated on the outer side just above or external to the capitellar epiphysis. The cases in which it appeared were Cases I, (II), IV, V, VI, VII, VIII, X, and XIII; it is obvious

in the accompanying tracings and photographs, and the description as it appears in the individual cases appears in the case records.

The first point for notice is that all these nine cases were fractures of the external condyle, and of this alone, the diagnosis being confirmed by the skiagraph in seven, and not doubtful in the other two. In Cases I, IV, VI, and VII the beginning of this deformity was noticed early in the course of treatment and its development watched. When first seen it presented in all four a sharply localized, almost sharp, spur just above the external condyle, the condyle itself being apparently in place and solid. Months later, when Cases I and IV were examined again, the bunch seemed in each case to have increased rather than decreased in size, and the spur was less obviously spurlike, differing only in greater size from the deformity found in the late examination in five other cases.

Now, not only were all these cases fractures of the external condyle, but in the X-rays (six in all) there was obviously an involvement of the diaphysis, a separation of a small scale on the outer side. Case I is most instructive in this matter, for while the first X-ray definitely shows that the projection is of the diaphyseal chip, not the condyle, the second X-ray shows that this displaced chip had actually grown in size in the five months that elapsed between the two views. In Case VI, also, the first skiagraph shows but a faint shadow; the second, two and a half months later, shows a spur of bone denser than the epiphysis itself.

From these cases, then, it is pretty evident what happens, —a small chip of the diaphysis, perhaps sometimes only a bit of periosteum, is carried away with the external condylar epiphysis and becomes displaced; the displacement in these cases seems, as we have seen, to be a rotation down and out. In this new position the displaced bone periosteum chip forms new bone, as the X-rays show. Why this does not always happen, why Case III, for instance, where the skiagraph shows a similar chip similarly rotated, why this case showed no obvious spur, it is hard to say.

In nine out of sixteen cases, at least, a spur did appear,¹ and in no case of supracondylar fracture was there a trace of such formation.

Apparently, this form of "callus formation" has not been definitely described before; but on looking up recorded cases, the writer finds that Kocher notes a like deformity in some cases after external condylar fracture.² Mouchet described deformities evidently similar,⁸¹ and Guedeney⁸² notes something

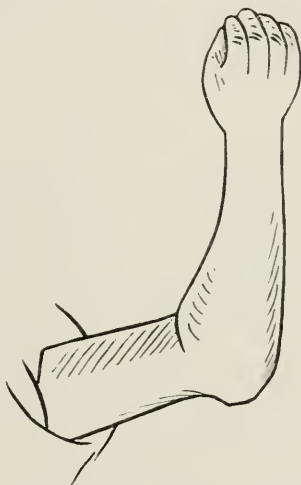


FIG. 41.—Deformity after union in a fracture of the external condyle (after Mouchet).

of the sort in three out of nine cases which he looked up. All these were external condylar fractures. Evidently the deformity is a fairly frequent sequel to this fracture, hitherto not definitely described.

When it occurs, it is an independent deformity above and outside the joint surface and is not a hinderance to motion, but especially in the thin arm of the child it is a visible deformity, and may (as in Case IV) be decidedly unsightly.

¹ The writer has since had the opportunity to watch the development of a like deformity in still another case exactly similar in appearance, X-ray findings and in gradual growth, to Case V, noted above.

² Loc. cit.

It is of course obvious that external displacement of the condyle when it occurs will produce a not very dissimilar deformity or exaggerate the projection of the spur. This was the case to some extent in Case VIII, and the appended figure, after Mouchet's plate, shows a case where the X-ray showed a projection due to outward displacement of the condyle itself.

A still different deformity also belonging to the external condylar fractures may best be discussed here, though it did not occur in any of the series which the writer followed from the start; that is the deformity due to non-union of the external condyle. The following cases have been seen by the writer at various times:

CASE XXXIII.—E. S., a boy of three years. At one and a half years of age fell, striking the left elbow. Two months ago fell again on the same arm, and is said to have refractured the elbow. Data rather vague. Comes in for advice as to the deformity. Elbow without swelling, with nothing to suggest any recent injury. There is marked loss of the carrying angle, in fact, a very slight reversal of the normal angle. The internal epicondyle and condyle are in normal relation to the shaft, but the external condyle is freely movable, through a short range, on the shaft of the bone. Above this fragment, about half an inch above the external condyle, is a well marked ridge anteriorly prolonged into a short spur at the outer side. Nothing to correspond to this is to be felt at the back or inner side. There is some displacement of the external condyle directly downward. The relation of the radius to the external condyle seems to be normal, and the connecting ligaments are apparently intact. Pro- and supination are normal in range. Flexion is normal. Extension is about 30° short of the straight line. At or near the maximum extension a considerable lateral mobility (of the forearm on the arm) is possible, the external condyle moving with the radius. Operation advised, but refused.

CASE XXXIV.—D. L., a boy of six years. Injury a year ago, fracture of left elbow. External condyle prominent below and outside its normal position; internal condyle in normal relation to shaft. Position of the olecranon approximately normal; head of radius apparently in normal relation to the ulna and

rotates in front of the loose external condyle. Pro- and supination can be carried out to the full normal limit. Flexion possible to 40° beyond the right angle, but extension limited 30° . The fragment of the external condyle is freely movable under the fingers, and without crepitus. No treatment.

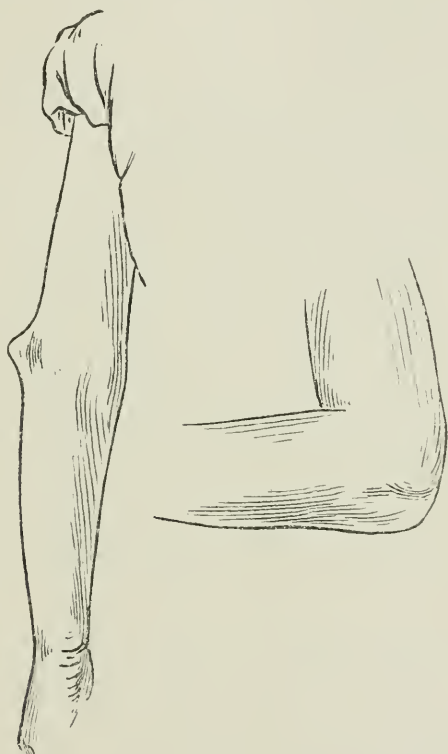


FIG. 42.—Posterior and anterior lateral views of Case XXXV.

CASE XXXV.—Boy of about eight years.¹ A movable fragment projects outward from the elbow, which evidently represents the external condyle with, probably, a part of the outer side of the diaphysis. This fragment is freely movable on the shaft, and moves rather with the radius than with the humerus. The shaft and the inner side of the bone seem not to have been in-

¹ Reported by courtesy of Dr. J. C. Warren, in whose service at the Massachusetts General Hospital the case was seen.

volved. There is some limitation of both flexion and extension. Rotation is free. There is some little gunstock deformity. The function is fair, and the patient comes in for the rather unsightly deformity. No operation, however, was undertaken.

The degree of deformity resulting from this condition varies, and is probably to some extent progressive. The direction of the displacement in these cases was downward; the disability not very great, and arising less from the limitation of motion than from the lateral mobility.

Cases of this sort are evidently not very rare.

Sir Astley Cooper figures and describes a case⁸³ from St. Thomas's Hospital Museum. Hamilton has seen five cases clinically. Kocher reports a case operated on.⁸⁴ Dunn⁸⁵ had a case. Hutchinson⁸⁶ reports a case of Treves's operated on. Schmitz,⁸⁷ Poland,⁸⁸ Malgaigne,⁸⁹ Smith, of Dublin,⁹⁰ are each credited with a case, and Hutchinson⁹¹ and Walther⁹² each had a case supposed to have been a T-fracture in which the outer fragment—the external condyle—remained united. Walther's case was an adult, the age of the other is not given.

Mouchet quotes Malgaigne, Volkmann, and Tillmanns to the effect that arthritis deformans may later complicate these cases.

The last of the list of deformities occurring is the deformity of displacement characteristic of epitrochlear epiphyseal separations or fractures. The displaced fragment may be readily palpable, even visible. It is readily seen in the tracing of Case XXXI, as the lower of two prominences at the inner side of the elbow. In Case XXXII the condition was about the same. In Case XXX the disappearance of the normal prominence of the epicondyle on the inner side was readily noted; the fragment itself lay down and forward and was not obvious.

In the Cases XXXI and XXX the union was fibrous only, but there was no evidence of progressive increase of deformity, nor is such progressive change indicated in cases reported, though fibrous union is the rule.

We find, then, in regard to deformity, that the present

series show in supracondylar fractures, gunstock deformity, backward displacement; in external condylar fractures, "spur" formation; in epicondylar fractures, displacement of fragment downward. The deformity is not a constant result, but in each class the given deformity is frequent, and the special deformity occurs *only* with the associated type of injury.

In regard to limitation of motion, it is in the writer's cases not radically different in degree in the various classes. Where the end result was known, the supracondylar fracture showed normal motion in seven; limitation of 5° in one; limitation of 10° in three; limitation of 20° or more in two.

The external condylar fractures, normal motion in three; limitation of 5° in three; limitation of 10° in two; limitation of 20° in two.

The epicondylar fractures, normal, one; 10° limitation, one.

But when we look into the character of the limitation in the various classes, we find that the limitation in the external condyle is consistently and always a limitation of extension. In the supracondylar fracture it is a limitation of extension in three, in one case considerable in extent; in one case flexion is slightly limited, while in two others flexion is little more than half the normal range. In the internal epicondylar fractures the only limitation is one of very slight loss of range in extension.

When we look into the relation of loss of motion to lesion and displacement in the individual case we find a pretty clear correlation in several cases. The case with extreme limitation of motion in flexion was Case XXVIII, where there was an obvious projection forward of the upper fragment; so also to a less extent in Case XXII. This is also obvious in the skiagraph of Case XXXVII, which showed like limitation of flexion.¹

¹ The limitation of flexion by backward displacement of fragments in the supracondylar fractures is evidently a usual type. It is excellently illustrated by several plates in Mouchet's article.

In the cases of supracondylar fracture followed by limitation of extension, the only case where this reached over 10° was Case XXIII; a reference to the X-ray of this case shows marked forward rotation, at least enough to correspond to the 15° of restriction of extension. The limitation of extension necessarily resulting from any degree of forward displacement or rotation is also illustrated by a plate given by Poland of a case where he performed excision on a united supracondylar fracture.

An analysis of Mouchet's series shows that in only three cases of supracondylar fracture was there limitation of extension, while in all but three (not the same three) of those showing definite backward displacement there was definite limitation of flexion (usually to within 30° of the right angle).

In the external condylar fractures the limitation is of extension only, and is independent of any discoverable displacement of the fragments. Evidently the movement of extension is checked in part at least by a filling up of the olecranon fossa. That flexion is not equally interfered with is probably due to the fact that the coronoid process (unlike the olecranon) does not, at the normal limit of motion, impinge directly on its fossa; normal flexion is stopped by the soft parts, and a little increase of bony thickness is here of less moment.

The limitation of extension occurring with epitrochlear fractures is apparently mainly a result of muscular tension resulting from the displacement of the origin of the epitrochlear group of muscles. There may be, of course, a direct limitation of flexion, owing to the interposition of the displaced fragment between ulna and humerus, as in the case of Payr, cited above. This must be very unusual.

In regard to motion, then, frequency of restriction is not very different in the various types, but so far as there is a difference it is rather more in favor of full recovery of motion with the supracondylar than in the other types.¹ The greatest

¹ Allis (*Annals of Anatomy and Surgery*, loc. cit.) notes the surprisingly good range of motion in nearly all of his cases of gunstock deformity.



Skiagraph of Case XXXVI. Anterior view.



Skiagraph of Case XXXVI. Lateral view.

degree of restriction on the other hand results from displacement in this same supracondylar type. The external condylar fractures show restriction of extension more often, but rarely in more than slight degree.

Restriction of pro- and supination is not to be looked for with any type.

In this matter of limitation of motion and deformity, some value may be attached to the study of cases where only the end result could be studied, where our knowledge of the original lesion is more or less a matter of inference.

CASE XXXVI.—M. C., girl of eight years. An old case of elbow fracture. Entered the out-patient clinic of the Children's Hospital six years ago with a fresh elbow fracture, the result of a fall from bed eight hours previously. The child was at the time

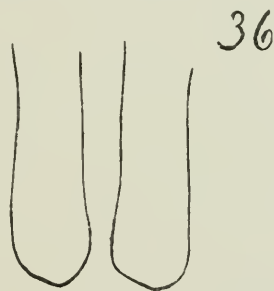


FIG. 43.—Tracings of the two elbows in Case XXXVI. Elbows in flexion.

of this record only two years old. The record says in effect, left arm considerably swollen from the middle of the forearm well up the upper arm. Pain on motion. No distinct crepitus or mobility. Thought to be probably a fracture of the external condyle.

After about seven weeks the motion was noted as nearly normal, and at three months all dressings were omitted. There was then much thickening about the outer part of the joint. The arm was used freely, flexion somewhat limited, but arm could be extended and even hyperextended. There was marked deviation of the forearm inward in gunstock deformity.

At five months. Flexion three-quarters normal. Marked gunstock deformity in extended position. Tracing taken.

At one year. Still some limitation of flexion. External condyle thick. Marked outward bowing when arm is extended. Second tracing taken.

After nearly six years the child was again seen.

There is still the same bowing in extension, which proves on comparison with the old tracings to have changed little, if at all. The elbow can be readily hyperextended to about 30° beyond the straight line, and in assuming this position the arm goes through the peculiar screw-like twist peculiar to these cases. Pronation and supination are normal. The arm is fairly useful.

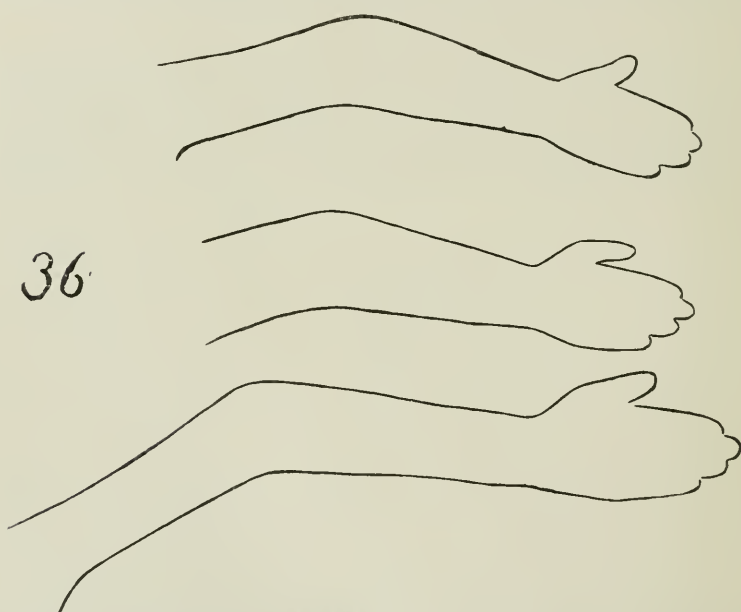


FIG. 44.—Tracings of Case XXXVI. 1. At seven weeks. 2. At eight weeks. 3. After six years.

but, owing to the extreme deviation in its axis, it works to great disadvantage in the matter of handiness, and is not strong enough to stand much hard use without subsequent pain.

Skiagraphs were taken. These seem to show clearly that the original injury was not a fracture of the internal condyle alone, but a fracture running from above the external condyle down and inward to the point on the trochlea indicated by the gap in the bone; probably the fracture followed the epiphyseal line inward from this point, but this can only be a guess. At all events, it



Skiagraph of Case XXXVI. Anterior view after operation.



Skiagraph of Case XXXVII. Lateral view.



Skiagraph of Case XXXVII. Anterior view.

belongs to those classed in this paper as transverse and oblique condylar fractures. From the side view it would seem that the limitation of flexion is due to bony deformity.

After due consideration of the disability which accompanied the deformity in this case, the child was sent into the hospital, where an open cuneiform osteotomy from the outer side was performed by Dr. Brackett. The result as to reduction of deformity was excellent, although some degrees of varus deviation persisted. After about three months *full* motion returned. The arm became functionally perfectly normal, in marked contrast to the previous condition. There is now, after eight months, no tendency to recurrence of the deformity.

CASE XXXVII.—K. C., aged ten years. Ten months ago fell on the ice and broke her left elbow. This injury was treated by a local practitioner, but apparently not as a fracture. The arm is now functionally serviceable, but flexion is possible only to

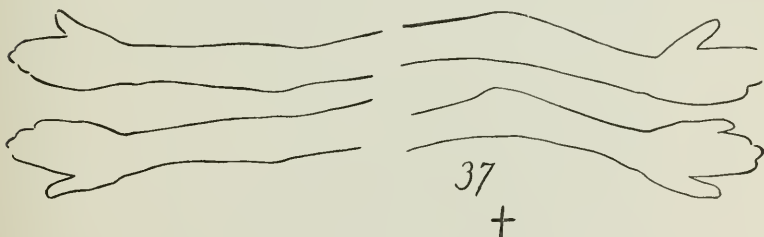


FIG. 45.—Tracings of Case XXXVII.

15° beyond the right angle. Hyperextension is, on the other hand, carried through an arc of 30° . Not treated.

CASE XXXVIII.—M. D., girl of about four years. Comes to hospital in relation to the marked gunstock deformity resulting from an old injury. The arm is functionally sufficiently normal. The X-ray shows an inward displacement of the forearm and the whole lower articular surface from a fracture which must have run close above, or partly in, the epiphyseal line. On the outer side the tip of the proximal fragment projects outward; internally, a fresh diaphysis seems to have formed, probably from callus limited by the stripped-up periosteum.

CASE XXXIX.—A. McM., aged twelve years. When two years of age she fell and fractured the right elbow. The arm is now perfect functionally, all motions being normal. There remains only the deformity shown in the tracings. Not treated.

These cases all show pronounced enough gunstock deformity. Case XXXVII shows marked limitation of flexion as well from backward displacement.

As to lesions, Case XXXVII was a supracondylar fracture, evidently, somewhat oblique down and in. Case XXXVIII shows a gap towards the inner side, not far from the epitrochlea, as marked in the skiagraph, which, with the deformity at the outer side of the bone, seems to justify us in regarding this as a fracture from above the external condyle down and in to a point just below the epitrochlea.

Case XXXVIII was evidently either a low supracondylar fracture or a separation of the epiphysis with a considerable diaphyseal fragment attached.

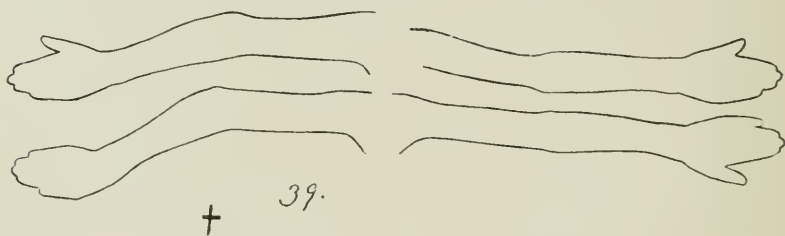


FIG. 46.—Tracings of Case XXXIX.

Case XXXIX was classed as a supracondylar fracture, so far as palpation made a diagnosis possible without an X-ray.

SUMMARY.

The conclusions from all these cases seem pretty definite and worthy of attention because, although the series is not long, there is a curious constancy in the findings.

It seems that with a fracture of the external condyle we have to expect some slight limitation of extension, not improbably permanent, and a possible local deformity from bony outgrowth; but need not fear any deformity as regards the axis of the arm and forearm, unless there should be failure of union of the fragment.

In separations of the internal epicondyle there is almost sure to be displacement of the fragment with slight local de-



Skiagraph of Case XXXVIII. Anterior view.

formity, but without deviation of the axis of the arm. There may be a little permanent loss of motion in extension.

With supracondylar and other supra-articular lesions there may be loss of motion, usually in flexion, but this occurs only in so far as it is conditioned by actual displacement of fragments. Non-union is to be left out of account.¹ Deformity is, however, frequent. It may result from direct displacement of fragments giving local deformity, or more often it may take the form of gunstock deformity.

The converse proposition that gunstock or varus deformity is a result belonging to the supra-articular fractures and to these alone seems, on the basis of the present evidence, equally clear; but, owing to the deep-rooted conviction that



FIG. 47.

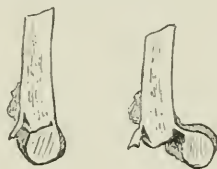


FIG. 48.

this deformity is most often the result of fractures of one or the other condyle, this particular subject deserves some further consideration.

The writer has not neglected to look up the data adduced in support of the usual theory. As a matter of fact these data are very few, and none of the writers who have been so positive about it seem to have bothered with the simple expedient of watching the course of fractures where the lesion had been definitely determined. Such evidence as is adduced is nearly always based on the examination of specimens long after union, specimens in which accurate determination of fracture lines is notoriously difficult.

In the majority of articles on the subject, one finds reference made to the articles of Allis,⁹³ Nicoladoni,⁹⁴ or Rieffel;⁹⁵

¹ Stimson quotes a case of non-union of a supracondylar fracture of Stephen Smith's, an isolated case where syphilis was the supposed cause; the patient's age is not given. •

and it would seem that the general acceptance of what the writer believes to be an error is the result of the copying from book to book of a statement, the original evidence in support of which is never re-examined. Very few authors seem to have examined for themselves. Stimson,⁹⁶ in a recent article, concludes from an examination of specimens and cases (his were cases examined after union) that the original lesion in many at least of the cases presenting this deformity was supracondylar. Kocher's observation of cases inclines him to a similar view.⁹⁷ Nunn⁹⁸ dissected a specimen with marked gunstock deformity in which there had evidently been a supracondylar fracture. In D'Arcy Powers's dissected cases⁹⁹ (four months after injury) there had evidently been an epiphyseal separation. Finally, in the Warren Museum (specimen No. 6443) there is a case of marked varus where the original break had unmistakably been above the condyles.

To return to the original data, Allis's much-quoted article was not in regard to the lesions permitting gunstock deformity, but on the mechanical causes producing it during treatment. He attempted, on the basis of nineteen old cases examined, to work out the mechanical problem. He showed that the support of bandage and sling from below presses up on the ulna, while the splint above presses down on the radius, owing to the difference in level of these bones at the elbow. "The pressure and counter-pressure are not opposite each other." . . . "Hence the upward pressure will not only tend to elevate the internal condyle, but to give the olecranon a peculiar twist towards the now displaced inner condyle. Thus are brought about the most constant deformities in injuries to the internal condyle of the elbow-joint, viz., elevation of the condyle and an inward twist of the olecranon."

Undoubtedly Allis believed internal condylar fractures to be the cause of gunstock deformity and entirely neglected the supracondylar,¹ but he expressly states in relation to the mechanical cause "that the deformity will be the same whether

¹ His list of cases shows external condyle four, internal condyle eight, out of twelve where a diagnosis was made.

the fracture involves the inner or outer condyle or the lower epiphysis of the humerus."

Careful reading of his article fails, however, to show any cases with deformity where there was any evidence of the actual lesion, even a recorded clinical examination; they were old cases and the diagnosis inferential, influenced doubtless somewhat by the theory of causation which suggests an "ascent of the internal condyle" as the most natural form of lateral rotation at the joint. Allis concerned himself with an explanation of the mechanical causation of the deformity, which was clear and definite and has rightly been accepted as correct, but he did nothing towards defining the lesions in the injuries in which this deformity occurs.

Rieffel's article is on cubitus varus and valgus in general, of rhachitic as well as traumatic origin. He admits that deformity may follow supracondylar fracture, and cites a case of Guedeney's (a valgus deformity) to show this; but, on the basis of a single case following what was apparently an external condylar fracture, writes that neither varus nor valgus commonly result from supracondylar fractures, but from those of one condyle. This view is, to judge by his article, largely an assumption.

Mouchet, who followed Rieffel's opinion in this matter, describes three cases of varus resulting from supracondylar, —one from a T-fracture, and four which he alleges followed fracture of the external condyle.

These last four cases are XXVIII, XXIX, and XXX of his series and one unnumbered case. The series is not quite convincing, for none of the X-rays, as they appear on the printed page, shows the line of fracture. In one there is no X-ray; one was not seen until six months after the accident; another not till six weeks, and the fourth was not treated by him, and first seen and skiagraphed after a month.

The cases of non-union of the external condyle are hardly pertinent to this discussion; it is conceivable that they might show almost any lateral deformity, varus or valgus; in the writer's cases it was varus.

CUBITUS VALGUS.

The valgus deformity then may, so far as we know, follow any of the forms of fracture, but is far less frequently met with than the gunstock type.

The writer's Cases IV and XXI, one an external condylar, the other a supracondylar fracture, are not only too few, but showed too slight a deformity to form a basis for any argument.

In the literature only a few cases are to be found. Von Lesser described the injury in the *Archiv für pathologische Anatomie und Physiologie* in 1883 (Vol. xcii, p. 1).

Poland describes a case¹⁰⁰ of Finley's where there was a twenty degree increase of the carrying angle, the result of a separation of the whole lower epiphysis.

Of Mouchet's two cases, one case, XXVI, followed an external condylar fracture. Case XXXII, in a patient of twenty-one years, was the result of an accident at two years of age. There was no movable fragment, but the X-ray showed the external condyle displaced upward and outward, and separated from the shaft by a clear space presumably representing cartilage.

There seems to be no note of any case where this deformity has followed epitrochlear fracture, where it might very conceivably occur.

GROWTH AS A CAUSE OF DEFORMITY.

Before leaving this subject, it may be well to mention the supposed causation of varus or valgus as a result of the arrest of epiphyseal growth. This is accepted by many as one cause.¹⁰¹ Mouchet goes so far as to consider it a common cause, and to doubt that these deformities are a result of faulty reduction. As a matter of fact, the actual evidence of such late and progressive deformity is apparently limited to one case.

Rieffel cites this case.¹⁰² A boy fractured his elbow at four years of age. The injury was supposed to be an epiphyseal separation. There was, according to the mother, no

deformity apparent at the time treatment was omitted, but within a year it was noticed. When seen, two years after the injury, there was a varus deformity of 155° , and a sharp angle of bone projecting forward above the external condyle. A plaster cast of the elbow was taken.

Three years after this the elbow, compared with the plaster cast above noted, showed an increase in the deformity of "some" degrees. There was no measurement at the close of treatment or at any time other than the two examinations noted. In the writer's Case XXXVI repeated tracings over a period of six years showed no such change.

It is a rarity for traumatic epiphyseal separations anywhere to cause appreciable arrest of growth, and it seems forced to account in this way for an injury so common as the gunstock deformity. While Rieffel's case seems sound, yet it would be a misfortune if, on this slender basis, we were to excuse our treatment from responsibility for deformities first noted some time after the injury.

After a review of all the evidence at hand, it still seems to the writer that these deformities are a result of poor reduction, not of growth, and that the belief that gunstock deformity follows fracture of either of the condyles is an error. It seems fair to reiterate that the data show that, while a very trifling varus deformity may follow external condylar fracture (not internal epicondylar fracture), the severer grades of this deformity follow this fracture only in very exceptional cases, if at all, unless as a sequel of non-union. The varus deformity belongs, in the rule, to the supracondylar injuries, where it is probably, in the rule, the result of the forces formulated by Allis.

TREATMENT.

The question is inevitable how far treatment tends to prevent or produce deformity and restriction of motion. To some extent this has been discussed in relation to the early results of treatment. Any further discussion must be prefaced by a brief review of the vast literature of the subject.

MOBILIZATION.

First, as to the question of mobilization. There has been a great deal written on this question alone, much of it to be found in the Transactions of the American Surgical Association for 1891 and 1895. As a rule, the opinions given here and elsewhere lack weight because they are based on general impressions, not on comparative series, and the question can hardly be considered as closed.

The older practice seems to have been divided between long fixation and such zealous passive motion as was advocated, for instance, by Dr. Warren¹⁰³ in the forties. Hamilton strongly advocated passive motion in these fractures from a very early stage of the treatment, and, owing largely to the weight of his authority, the practice of early and vigorous passive motion became general.

Then in 1879 Verneuil brought out his article on the harmlessness of fixation in joint disease, and in the following year¹⁰⁴ applied the same reasoning to the treatment of fractures. Pilcher¹⁰⁵ and Allis¹⁰⁶ early expressed themselves against the practice of passive motion; and a few years later Sands brought out a very telling paper¹⁰⁷ which severely arraigned the routine practice: general discussion followed for the next ten years.

On record against passive motion as a routine, we find¹⁰⁸ Allis,¹⁰⁹ Gibney,¹¹⁰ Shaffer, Poore,¹¹¹ Bull, Abbé, Homans, Geister, Dandridge, Powers,¹¹² Phelps,¹¹³ Roberts, Carmalt, and others, while others advocated the use of passive motion only after a given time has elapsed. This time was given by Conner as six to seven weeks; Stimson, four to six weeks; Czerny, Bradford, Dawbarn, and Kinloch, about four weeks; Sayre, Nancrede, and for Hutchinson, Jr.,¹¹⁴ three weeks; Annandale,¹¹⁵ two weeks; Gay,¹¹⁶ ten days. Hamilton, Bruce,¹¹⁷ and Lane would begin passive motion very early.

Roberts in 1892 sent out letters to members of the American Surgical Association and others, with a view to ascertaining the actual practice in regard to passive motion. From the replies received, he gives¹¹⁸ the following figures:

The number who began passive motion within four weeks was 64; began after four weeks, 7; used no passive motion, 15; no answer, 2. Total, 88.

To-day there seem to be no advocates of the radical passive motion of earlier years, and even the adherents of the method of very early mobilization and massage in fractures in general¹¹⁹ provide in elbow fractures for a reasonably complete fixation, and a very cautious use of massage and passive motion only within the limit of causing pain.¹²⁰

Such series of cases as have been cited in defence of the various opinions and practices given above would tend to show the question of mobilization is not of extreme importance either way; the results as to motion may be good with one or the other method.

Allis¹²¹ gives data as to motion in seventeen old cases of deformity treated by different surgeons, and in these, confessedly poor results, the range of motion is surprisingly good, only three of the seventeen showing any loss of motion; in these the restriction was not great.

Fowler¹²² treated twenty cases with passive motion, beginning at four to fourteen days. In sixteen the result is called perfect; the loss of motion in three was slight, marked in only one.

Powers,¹²³ out of seventy cases treated without routine passive motion, got satisfactory results as to motion in all but one (motion in this one only 45°).

Poore¹²³ in a total of forty-nine had complete recovery of function in thirty-seven, slight loss of motion in nine, much loss in one, and one ankylosis.

Hutchinson, Jr.,¹²⁴ in fourteen cases (late passive motion) had perfect recovery in six, a loss of perhaps 20° of motion in eight.

Guedeney¹²⁵ had only one partial ankylosis in sixty cases.

Roberts, in the inquiry above noted, found that of his eighty-eight surgeons, using or not using passive motion, only eight expressed themselves as doubtful of obtaining good results as to motion.

Such data as these do not warrant very definite conclusions as to the merits of relatively early or late passive motion, or of its entire disuse as a routine.

In regard to the use of *very* early massage and passive motion, there is a point in relation to the very interesting article by Mouchet which is worth consideration. His cases were treated on this plan, though removable apparatus (of plaster of Paris) was used. As has already been noted, the recovery of a considerable degree of motion came much earlier, evidently, than we are in the habit of seeing it. On the other hand, the monograph gives no data to show better end results, if as good¹ as we usually see here; as in the writer's series, for instance. In fact, the impression left by a careful study of his paper, case by case, with the X-rays of each one as a guide, left the writer with the strong impression that the results were not especially satisfactory; restriction of motion in considerable degree was not rare, and marked permanent displacements, though exceptional, were not sufficiently exceptional.

It would seem to the writer that this method, though shortening the time of treatment, probably sacrifices that fixation which is essential, especially in supracondylar fractures, to the best attainable result.² It is not certain that the results in this series are chargeable to the method; if they are, it is a question if this is not too high a price to pay for early restoration of motion.

POSITION IN TREATMENT.

The question of position has been as fertile a source of discussion as that of mobilization, and the discussion is not closed as yet. Since 1880, when Allis attacked the routine

¹ Mouchet, in the rule, contents himself with noting the motion as good or free without stating the degrees of motion, so this point cannot usually be accurately decided.

² The benefits of this form of treatment in regard to early recovery seem dependent on beginning massage very early: to fix until union has taken place and then begin massage, etc., is not a modification; it is an entirely different treatment.

right-angled splint and proposed treatment in extension, the question of position has had partisans on both sides. The extended position has had many advocates here¹²⁶ and abroad.¹²⁷ Vincent has used a modified method,¹²⁸ extension, later changed for flexion, as has Gerard-Marchant. In this country Moore has advocated a changing angle (without full extension), and Pilcher early advocated a routine angle of 135° , still used by Powers in certain cases.

Next came the proposal to use an acutely flexed position. This scheme seems to have been independently devised by several men. Smith, of Boston,¹²⁹ as a result of carefully conducted experiments on the cadaver with artificially produced fractures, found position best maintained in acute flexion. He tested the method clinically and adopted it. Since then Lund, of Boston, and Frazier, of Philadelphia, have devised improved methods of fixation in this position.¹³⁰

About the same time with Smith, Jones,¹³¹ in England, adopted suspension of the flexed arm in a Thomas "wrist-halter," in the notion that such suspension interfered less with circulation than is the case with splints. He used the method with success in many cases.

Bruce,¹³² apparently influenced by Thomas' suspension of the flexed arm in joint disease, adopted the same scheme at about the same time.

There are, then, three entirely different methods of treatment especially to be considered.¹

The right-angle flexion treatment may be assumed as the most familiar,² and the others compared with it.

As to the treatment in extension, its advantages seem to consist only of a better control of any possible varus displacement. Berthomier¹³³ claimed it gave better reduction of fragments, but Hutchinson, Jr.,¹³⁴ repeating his experiments, came

¹ It is the position that Roberts in 1892 found used by sixty-five out of eighty-seven surgeons in this country (fifteen preferred the straight position, seven used both).

² Traction as used by Bardenhauer and his disciples needs no more than passing mention.

to entirely different conclusions, as did Smith. Lauenstein claimed better results in motion, as have others, but without a shadow of proof. On the other hand, Wright¹³⁵ reports having had to resect in five cases which had been treated by this method, and to do forcible "infracion" in four others; while Powers¹³⁶ reports similar ill results from the method in three cases of his own and in one each by Weir and Bull. This is certainly not a first-rate showing.

Dandridge and Moore sum up the case against the method in saying that it makes immobilization of the fragments less easy, and that it renders flexor displacement probable.

As to the flexed position, acute or at a right angle, Mouchet gives two cases¹³⁷ of supracondylar fracture where reduction and retention were impossible in extension; but in one case easy at 90°; while in the other retention was practicable only in more acute flexion. Kocher¹³⁸ found reduction of the external condyle (in open operated cases) easiest with a right-angled flexion and pronation. Hutchinson, Jr.,¹³⁹ found traction at a right angle gave the best position experimentally, and Moore¹⁴⁰ found that the play of the fractured external condyle was limited by the tension on the fascia brought about by a right-angled position. Hamilton, on the other hand, noted exceptional cases with better retention in extension.¹⁴¹

Smith went farther than this. He produced, with the chisel, fractures of the internal and external condyles and above the condyles, and as a result of repeated trials on different subjects found the position of most accurate and firm fixation to be that of forced acute flexion. This, according to him, was the case with all forms of fracture. He found the fragments very poorly held in extension, with not much better results at 135° or 90°. In fact, with the external condylar fracture, he found 135° to be the point of maximum mobility, and supination at this or at a right angle produced marked displacement of the fragment, while flexion and pronation insured pretty fair coaptation: this is doubly interesting in view of Kocher's findings at operation.

In order to follow out for himself the conclusions of Smith and others, also to study something of the relation of the periosteum to reduction and the maintenance of reduction, the writer carried out a few experiments on the cadaver. These were in part performed on cadavera of the new-born, in part on the cadaver of a child of six years. These are here given in detail.

EXPERIMENTS.

EXPERIMENTS ON THE CADAVERA OF NEW-BORN CHILDREN AS TO EPIPHYSEAL SEPARATION AND REDUCTION.

I.—Right elbow hyperextended; comparatively little force needed to produce a separation of the whole epiphysis and displacement backward. Proved to be a pure epiphyseal separation. Displacement backward very easy after the separation was once effected, but displacement forward or laterally definitely limited, the periosteum having given way only in front. (Fig. 82.) Readily reduced and firmly held in position of acute flexion, much less well in extended position, and only fairly well at a right angle. (Fig. 82.)

II.—Lower epiphysis of left humerus wrenched off by a thrust applied laterally, inward on the epiphysis, outward on the lower end of the diaphysis. Pure epiphyseal separation with displacement inward. Periosteum intact on the inner side. Displacement of the epiphysis possible only in the direction of the original displacement.

After reduction, the position is firmly retained in the position of acute flexion, less well at a right angle or in extension. Cutting the triceps tendon without damaging the periosteum or ligaments distinctly lessens the firmness with which the fragment is held in acute flexion.

III.—Diaphysis held firmly while a forward thrust is applied to the epiphysis from behind. Clean separation of the whole epiphysis forward. The periosteum is torn posteriorly but not anteriorly. Displacement backward prevented by the intact periosteum. (Fig. 83.) Position of reduced epiphysis fairly retained in the straight position or at a right angle, though not without lateral mobility. In acute flexion the epiphysis is sharply displaced forward, as is shown in the figure.

EXPERIMENTS ON THE ELBOWS OF A CADAVER (MALE) OF SIX YEARS.

IV.—A fracture of the external condyle attempted. The humerus was first fixed in a vise, then the arm was flexed, and a sharp blow struck on the posterior surface of the ulna. It proved impracticable to produce a fracture in this way. Then, with the arm fixed as before, and the elbow semiflexed, a blow was struck on the cut end of the radius in the line of the forearm.

A *supracondylar* fracture resulted, with the *periosteum* completely torn at the back, *partially torn in front*. On trying the effects of the various positions, the following results were obtained:

Extension produces, without any manipulation, a marked backward displacement, and the extended position *permits* further backward displacement and rotation in the long axis of the bone, but forward displacement is checked by the periosteum in front.

At 135° there is the same backward displacement, and the same further displacements are possible on manipulation.

At 90° the fragments rest in fairly natural position, but on manipulation backward, displacement, displacement in valgus, and the rotatory displacement, are all possible.

In *acute flexion* there is, from the position *per se*, a definite forward rotation of the lower fragment; on manipulation, rotation about the vertical axis is still possible, but backward displacement and rotation in the direction of valgus or varus are absolutely checked.

IVa.—In the same specimen a fracture of the *external condyle* was then produced (with a chisel), and the ligamentous attachments, except those with the radius, were cut away. By securing apposition of the supracondylar fracture by pegs, it was possible to study pretty accurately the effects of position on the external condylar fracture.

In the *extended position* the external condyle was displaced backward and outward (and in this position outward or backward dislocation of the ulna was obviously very easy after cutting the internal ligaments. In this position, rotation of the fragment in all directions and extreme outward displacement were possible.

At 135° practically the same displacement was possible, but the position, *per se*, produced no backward displacement.

At 90° the same, except that backward luxation of the ulna is not now possible.

In *acute flexion* there is a slight tendency to rotation up and forward and to a separation of the condyle from the shaft at the outer side. In this position the ulna is rigidly held in its normal relation to the humerus (irrespective of the loss of the outer edge of the trochlear surface) by the tension on the ligaments; the condylar fragment is not firmly fixed, but in this position displacements are more easily reduced and retained than in the others tried.

V.—The other elbow of the same cadaver. In this a like attempt at external condylar fracture resulted again in a *supra-condylar* break, but in this case the anterior layer of periosteum gave way while the *posterior* was only *partly* torn.

In this specimen, also, *extension* produced slight backward rotation, and permitted extreme backward displacement and all rotations.

At 135° the conditions are the same, except that the backward displacement is gone.

At 90° there is no displacement, but the position permits moderate backward displacement and all rotations (including varus deformity, when pressure is applied to the forearm above and below) producing supination.

In *acute flexion* there was in this specimen no forward rotation (prevented by the posterior periosteum), and the fragments were as before locked against all displacements and in nearly normal position.

Va.—In this specimen, also, a separation of the *external condyle* was effected, but in this case only the capitellum was separated, and its *posterior periosteal* connections were left *intact*. Practically, no displacement was possible except for a gaping anteriorly in *extension*.

The *anterior ligaments* were then *entirely cut away*. Extension now produced a subluxation in which the capitellum was carried backward; otherwise, the effect of the various positions was exactly as in experiment IVa.

DEDUCTIONS AS TO TREATMENT.

It has certainly been shown that good, or at least fair, average results may be obtained by any of the forms of treatment more usually advocated, but as to why the one treatment is better than another, or for what cases it is better suited than another, we find only such evidence as has already been cited.

The deduction that the writer would make from all these data as they stand, is that while repair and recovery of motion may be more or less rapid according to the joint effusion and to the reparative processes about the joint, yet, in children at least, the outcome under any of the ordinary methods of treatment very rarely gives ankylosis, and the loss of motion is pretty accurately in inverse proportion to the accuracy of reposition. Massage and passive motion or the fixed adherence to a given position have little to do with it. In the child, at least, good reposition means an eventual good result. Of this the writer feels sure not only from the varying success of his own cases, but from a careful consideration of the data in the literature as well.

Kocher puts the whole matter most trenchantly when he writes (of external condylar fractures), "*Man hat entweder gut reponirt, und bekommt gute Heilung, oder man hat schlecht reponirt und bekommt schlechte Heilung.*"

The question of treatment and position narrows itself down almost exactly to the question of the manner of reduction and retention best adapted to overcome and prevent displacement of the fragments.

Curiously enough there has been very little variation of treatment according to lesion. Guedeney says, "*Nous observons que, pour chaque chirurgien, la position qu'il préconise est, sauf de rares et légères exceptions, la même pour toutes les fractures du coude, quelque soit leur siège.*"¹⁴²

Moore¹⁴³ varies the angle throughout, but avoids full extension in the supracondylar cases. Stimson varies treatment somewhat according to lesion, as do Curtis¹⁴⁴ and Woodbury,¹⁴⁴ and Powers¹⁴⁵ systematically abandons full flexion

in cases showing a tendency to gunstock deformity, and uses fixation at 135° for ten to fourteen days, and then a right angle.

Apart from these few exceptions, Guedeney's statement seems to hold equally true elsewhere than in France.

It is certainly reasonable to suppose that, with the definite types of fracture that we have seen to exist and the definite association of these types with special varieties of good results, different lesions will require different treatment.

External condylar fractures, for instance, as we have seen, are not likely to result in varus deformity (nor valgus), but are somewhat likely to show

I. Local deformity;

(a) outward or outward and backward displacement of the condyle with or without displacement of the ulna;

(b) "spur" formation above the condyle.

II. Limitation of extension.

III. Possible non-union or delayed union certainly suggests that a definite fixation of not too short a time be used, but more especially calls for a proper reduction of any rotation of the condyle.

The limitation of extension can hardly be prevented except so far as careful reposition prevents it; to institute very early massage and passive motion involves an extra risk of non-union.

The deformity also calls simply for accurate reduction. Correction of outward or backward displacement is best attained in flexion combined with lateral compression of the condyles (see Case VI), and the rotary displacement of the condyle is best attacked with the arm in flexion by upward and inward pressure exerted on the lower part of the fragment; acute flexion is the position where this reduction is easiest (see Experiment IVa, Smith's experiments, and Kocher's operative observations).¹

¹ If reduction in this fashion is not successful, operation is certainly to be considered in these cases.

The spur formation is to be prevented only by correction of rotation (and possibly by pad pressure to maintain the position).

As to the position for retention, Smith's experiments and those of the author, the cases recorded by Mouchet and others, show extension liable to produce displacement: moreover, there is no reason for the extended position in external condylar fractures, as varus deformity is not to be expected in these cases. Right-angled flexion has no special advantage, and, following the experimental and clinical data, it is certain that acute flexion locks the ulna into place, and probable that it may also fix the external condyle by tension on the ligaments and fascia. With the ulna and radius fixed, anterior displacement from acute flexion is not to be feared in these cases.

For external condylar fractures, then, our treatment works out

Reduction by flexion and pronation, with lateral pressure and pressure to correct rotation.

Retention at an acute angle.

In the supracondylar fractures (and in epiphyseal separations), we have to guard against

I. Backward displacement giving limitation of flexion, and backward rotation.

II. Varus deformity.

The backward displacement, and more especially the backward rotation, are favored, if not actually produced, by the extended position (Experiments I, IV, and V). Hence the extended position is to be avoided if possible.

Reduction can be accomplished by traction in the flexed position, and maintained in a right-angled splint with strapping to prevent the forearm slipping backward, and a pad in the bend of the elbow to give counter-pressure.

A perfectly efficient reduction and prevention of backward displacement may be secured by acute flexion, but Cases XIX, XXIII, and XXIV, and Experiments III and IV, show clearly that this position may convert the posterior displacement into

an anterior displacement and anterior rotation. Acute flexion should then be used, if at all, only where this displacement proves not to be produced.¹

As to the much discussed varus deformity, it is certainly most important, but the easiest position in which it can be guarded against, full extension, is unwise in view of the greater chance of backward displacement in this position, and the apparent frequency of poor results in regard to motion.

The pressure of splints and bandage at a right angle, shown by Allis to contribute to produce varus, is largely avoided by using an internal angular splint with an oblique surface fitting the forearm, the so-called Smith splint.

With this splint good results are achieved; for further protection it seems rational gradually to extend the angle at about two weeks to about 135° ; this can *then* be safely done without producing backward displacement, and gives a chance to detect and correct any tendency to varus.²

For supracondylar fractures, then, we have as a logical course of procedure

Reduction by traction and flexion.

Retention at a right angle on a specially fitted splint, with fixation by adhesive straps on the forearm to guard against backward displacement.³

After an interval, extension to 135° or thereabouts to detect and correct varus displacement.

In epitrochlear separations and fractures, the acutely flexed position best relaxes the muscles and allows reposition of the fragment, and a pad may be used to secure the best possible maintenance of position (see Case XXX). The pros-

¹ A comparison of Experiments I and III and IV and V shows that the conditions in this respect are in part dependent on torn or intact posterior periosteum, conditions differing in different cases.

² The writer has not yet used this scheme, but is convinced of its theoretical advantage over the reversed order of change adopted by Vincent, G. Marchant, Powers, and others.

³ Dr. C. A. Porter has used in a few cases an accessory splint on the inner side of the upper arm to give pressure on the lower fragment to avoid varus, which seems logical.

pect of bony union is, however, poor at best; and since the result to be avoided is apparently a muscular shortening, it would seem that in this form of fracture very early massage and early mobilization might properly find their place as a routine treatment.¹

As to operative treatment of these fractures for irreducible displacements or for poor results, it is too early as yet to be very definite in giving the indications. A partial list of operations recorded follows this paper as an appendix.

Certainly in all compound cases, in cases where reduction is impossible by ordinary means, and in cases showing marked disability or deformity months after treatment, operation will be done much more frequently in the future than in the past.

In conclusion, the writer would present as deductions from this investigation the following propositions:

I. The usual classification hardly expresses the conditions of lesion as they actually exist.

II. The lesions frequently met with are

- (a) external condylar fractures;
- (b) supracondylar fractures;
- (c) epitrochlear separations;
- (d) separations of the whole epiphysis in the above order of frequency.

III. These forms have well marked special forms of deformity associated with them.

- (a) External condylar fractures frequently show the described "spur" formation with or without displacement of the condyle itself.
- (b) Supracondylar fractures frequently show gunstock deformity as well as backward displacement of the lower fragment.
- (c) Epitrochlear separations show displacement of the fragment down and forward.

¹ Mouchet's cases, twelve so treated, with observation of end results, show only three with limitation of motion, a showing which certainly speaks well for this treatment *in this class of cases*.

IV. As to loss of motion.

- (a) The loss of motion from external condylar fracture is rarely considerable, and is a loss of extension.
- (b and d) Supracondylar fractures and separations of the epiphysis may show a loss of motion due to bony displacement, usually a loss of flexion from backward displacement.
- (c) Epitrochlear separations may show a loss of extension apparently due to muscular shortening.

V. Ankylosis or extreme loss of motion is rare in children, is practically independent of massage or passive motion, is due to displacement of fragments and their union in displaced position.

VI. Position in treatment is important only as it affects reduction and retention.

VII. Treatment is to be varied to fit the lesion and displacement found, as indicated above.

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(PARTIAL LIST ONLY.)

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König (quoted by Stimson).

Piechaud. *Gaz. hebdomadaire de médecine et de chirurgie*, 1889, 555 (quoted by Mouchet).

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Piechaud. *Loc. cit.*

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Tuffier. *Bulletin Société de Chirurgie*, 1893, p. 327, and *Revue de Chirurgie*, 1900, p. 405.

Mouchet. *Loc. cit.*

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Operations in supracondylar fractures.

For reduction, Broca and Mouchet (quoted by Mouchet, *loc. cit.*);

For nerve lesion, Claus. *Centralblatt für Chirurgie*, 1893, No. 39; Payr, *loc. cit.*

Operations in external condylar fractures.

For poor position, Kocher, loc. cit.;

For non-union, Kocher, loc. cit.; Stimson, *ANNALS OF SURGERY*, 1900;
Smith and Treves, quoted by Hutchinson.

Operations for epitrochlear separation *per se*.

Kocher, loc. cit., three cases.

The operations for nerve lesion, especially in epitrochlear cases, will be found in the text.

For the many operations necessitated by compound epiphyseal separation, Poland's book may be consulted; they are not included here.

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¹⁰⁰ Loc. cit., p. 279.

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TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 13, 1901.

The President, B. FARQUHAR CURTIS, M.D., in the Chair.

STAB WOUND OF THE ABDOMEN, WITH THREE PERFORATIONS IN THE TRANSVERSE COLON.

DR. A. B. JOHNSON presented a colored woman, aged thirty-two years, who was admitted to the New York Hospital on the afternoon of October 10, 1901. One-half hour before admission she was stabbed in the right arm and in the left side of the abdomen with a knife, the size of which was uncertain. On admission, a large, well-nourished individual, slight shock present, and a good deal of excitement; temperature, 99.2° F.; respiration, 36. There was an incised wound of the right forearm and a through-and-through stab wound of the right biceps. There was an incised wound two and a half inches long, horizontal in direction, in the left hypochondrium, midway between the mammillary line and the midaxillary line over the ninth interspace. The right side of the abdomen was tender and slightly rigid, and examination showed a portion of omentum prolapsed into the wound. An hour and a half after the injury, the wound being enlarged, there was revealed an incision two inches long in the peritoneum; the cartilage of the ninth rib had been divided; there was a little free blood in the abdominal cavity; the omentum overlying the transverse colon in the neighborhood of the wound was occupied by a hæmatoma about as large as a silver dollar; beneath this hæmatoma three penetrating wounds of the gut were found, all on the anterior wall of the gut. The largest opening was about one-half an inch in length; the openings were plugged with prolapsed mucous membrane; there had been no apparent escape of intestinal contents. The holes in the gut were closed by a

series of mattress sutures of fine silk. After local cleansing, the gut was replaced and the abdomen closed.

A single rise of temperature to $102\frac{1}{2}^{\circ}$ F. occurred on the day following the operation. There was no other untoward symptom. The wounds healed by primary union. The patient got up on the fourteenth day, and went home on the sixteenth day.

GANGRENOUS HERNIA; RESECTION OF THE GUT.

DR. A. B. JOHNSON presented a man, aged forty-three years, who was admitted to the New York Hospital, September 7, 1901, in the morning, with the following history. Reducible inguinal hernia on right side, imperfectly controlled by a truss, for several years. At eight o'clock in the evening before admission, hernia suddenly became painful and irreducible. Pain severe, cramp-like, and paroxysmal. Vomiting followed, and has recurred since at frequent intervals.

On admission, temperature 102.5° F.; pulse, 100. Face drawn and anxious. Vomited matter green and watery, not fecal. Tense and tender tumor in right groin as large as a small fist. No impulse on coughing. Fourteen hours after the symptoms of strangulation had appeared, an incision was made over the tumor. On opening the hernial sac its contents were found to be a coil of small gut ten inches in length, entirely necrotic, and bathed in foul-smelling, bloody fluid. The aponeurosis was split as far as Bassini's operation, and healthy gut drawn out of wound. The loop was found to be so close to the lower end of the ileum that its lower portion could with difficulty be sufficiently exposed. The necrotic portion was excised, during which there was some soiling of the external wound with the contents of the gut. The divided ends were united with a Murphy button. Separate suture of the mesentery with fine catgut. No additional sutures of intestine. After salt irrigation, gut was replaced in the abdomen, and the wound closed by Bassini operation. There was no shock. The vomiting ceased. There was a rise of temperature to 104° F. at the end of twenty-four hours, but the belly remained flat and soft. The bowels were moved on the second day. The button was passed on the seventh day. Stitches removed at the end of a week. Low grade of infection noted at one angle of the wound on the twelfth day. Wound opened at this point, and through this opening a catgut suture was subsequently discharged.

Patient's recovery was otherwise uneventful. He left the hospital on the forty-first day, and has remained well since.

ACUTE PYELONEPHRITIS; NEPHRECTOMY.

DR. A. B. JOHNSON presented a woman, twenty-eight years old, married for ten years, and the mother of six children. She was admitted to the New York Hospital on August 10, 1901. Seventeen days previous to that she had given birth to a child. The confinement was normal, but subsequent to that event she suffered from retention of urine, and was regularly catheterized by her physician. After two or three days the use of the catheter was no longer necessary; but she began to suffer from painful and frequent urination and a severe, continuous pain in the left hypochondrium. About ten days after her confinement she became seriously ill. She had frequent chills, followed by high temperature, with restlessness and extreme prostration. At the time of her admission to the hospital she was apparently suffering from profound sepsis. Her temperature was 105° F.; pulse, 120; her tongue was dry and covered with a brownish coating. She had frequent sweats. The pain on urination as well as the frequency had ceased. A physical examination of her pelvic organs did not show anything wrong. She complained of great pain and tenderness over the region of the left kidney. The muscular rigidity was so pronounced on that side that accurate palpation of the abdomen was not possible. The urine showed very little that was abnormal: its quantity was somewhat diminished, and its specific gravity lower than normal. It contained a moderate number of pus- and blood-cells.

On August 11, 1901, a five-inch incision was made on the left side, parallel to and half an inch below the costal border, exposing the left kidney, which appeared to be considerably swollen over its lower half. A nephrectomy was then done. In delivering the kidney, the peritoneum was opened, and the right kidney was palpated and found to be normal. At the time of operation the temperature of the patient was 105.2° F. Subsequent to the operation it steadily and rather rapidly dropped to 99°; then it gradually rose again, in the course of two or three days, to 102.2°, at which point it remained for two days, then falling to normal and remaining so.

The urine after the operation continued to be secreted in

large quantity. The patient's convalescence was rapidly established, and she was discharged cured on the twenty-sixth day after the operation.

Dr. Johnson said this was probably a case of acute ascending infection of the kidney, although one cannot positively exclude hæmatogenous infection. The speaker said he did not resort to catheterization of the right ureter, in order to ascertain the condition of the kidney on that side, for fear of infecting that organ also. In view of the fact that that kidney was not enlarged, and in the absence of all local signs on that side, he felt justified in removing the opposite kidney.

CALCULOUS PYELONEPHROSIS; NEPHRECTOMY.

DR. A. B. JOHNSON presented a boy, nineteen years old, who had enjoyed good health up to five years ago, when he had a sudden, severe attack of pain in the region of the left flank. After this attack he broke out in a cold sweat, and felt much prostrated. He passed no blood at the time, nor since. Since then he has had similar attacks at intervals of a few months. He always vomits during an attack, but there is no pain on urination nor undue frequency. The pain he complains of is agonizing in character, but it does not radiate, remaining fixed in the left flank.

The patient was admitted to the New York Hospital on August 14, 1901, one day subsequent to his last attack. He was considerably emaciated. His urine was turbid, amber, with a heavy, reddish precipitate (pus); the specific gravity was 1021; it contained a large amount of albumen, pus, and blood. There were pain and tenderness over the left flank, with marked muscular rigidity. A radiograph was taken, which showed the presence of several stones in the kidney.

On August 19, an eight-inch incision was made half an inch below and parallel with the left costal border. The kidney was considerably enlarged, and formed a sac in which a number of stones could be felt. The substance of the kidney was so far destroyed that it was thought an earlier convalescence could be obtained by removal of the organ than by incision. After the kidney was removed, it was found that most of its substance had disappeared. There was an anomalous superior renal artery which was accidentally cut, causing a profuse hæmorrhage. The patient's convalescence was uninterrupted, and he has since enjoyed excellent health.

INTRACRANIAL NEURECTOMY FOR TRIFACIAL NEURALGIA.

DR. WILLY MEYER presented a man, fifty-five years old, who gave the usual history of neuralgia of the fifth nerve, from which he had suffered for fifteen years. In 1893 he was operated on at the Post-Graduate Hospital, where one of the branches of the nerve was divided, which gave him a respite for nine months. Five years later he was again operated on by Dr. Stewart at Bellevue Hospital, an excision of the third branch of the nerve being done at the base of the skull. From that time on the man was free from pain until the latter part of 1899, when the second branch of the nerve became chiefly affected.

When the patient was first seen by Dr. Meyer, during the past summer, he was suffering intensely, especially while eating or drinking, and his general condition was such that it was decided to perform an intracranial neurectomy to give him relief. The Kraske-Hartley operation was selected. Five trephine openings were made over the site of the usual incision, and these were then connected by means of the Gigli saw. After turning up the bony flap it was found that the dura mater, which had become adherent to the bone as a result of the previous operation, had also been accidentally divided by the saw; this caused a severe hæmorrhage, and before it could be reunited a good deal of the bone had to be cut away with the rongeurs. In spite of the delay caused by this accident, which Dr. Meyer said might have been avoided if a director had been employed to guide the course of the saw, the operation was completed at one sitting. With a large speculum the brain was elevated, the meningeal artery divided, and access thus gained to the foramen ovale. Then the third branch of the nerve was divided and pushed into the foramen as far as possible. The second branch of the nerve was then divided at the foramen rotundum and twisted out. On account of the length of time already consumed by the operation, the entire ganglion was not removed, as had been originally intended. The flap was accordingly turned back into place and the wound closed. The patient made an uneventful recovery. The pains of which he complained before the operation have entirely disappeared; but, on account of the adhesions, he complains of some drawing sensations at the site of the scar which annoy him at times.

Dr. Meyer also referred to a second case of intracranial neurectomy in which injury to the dura mater was avoided by carefully introducing the Gigli saw and passing it upon a guide. In this case the internal meningeal artery, after its division, was lost control of while attempting to tie it, but the hæmorrhage was easily controlled by torsion. The speaker said he advised doing the operation in one sitting rather than two.

DR. JOHN F. ERDMANN asked Dr. Meyer if in his cases there had been any peculiar delusions or a rise of temperature following the operation. The speaker said that in two of his cases the operation was followed by delusions and an elevation of temperature which persisted for about a week.

DR. CURTIS said that in one of his cases there was such a profuse capillary hæmorrhage that the operation had to be discontinued. The wound was packed for forty-eight hours, and when it was reopened the same thing occurred. A week later it was again reopened, and again the oozing was so profuse that nothing could be done. Curiously enough, the patient was freed from pain by the operation, although nothing whatever was done to the nerve.

DR. ROBERT H. M. DAWBARN said that while the end in Dr. Meyer's case apparently justified the means, still, he could not agree with him upon the question of going ahead and completing the operation in spite of severe hæmorrhage. In any case where the bleeding is severe, it is perhaps well to part the operation in the middle, and wait a number of days until the patient has had time to recover from the chief cause of shock. The speaker said he had followed this plan in a number of operations on the neck as well as in other regions of the body, where the loss of even an additional ounce of blood might have proved fatal, whereas, by waiting for a few days and then completing the operation at a second sitting, the patient's life was saved.

Dr. Dawbarn said that when a wound is packed to control bleeding, non-absorbent gauze should be used instead of the ordinary absorbent variety. The latter must, by its capillarity, become soaked with blood before it can begin to check the hæmorrhage, and this may make a difference, in a large wound, of several ounces of blood lost.

DR. MEYER, in closing, said it was not his intention to criticise those who prefer to do the operation at two sittings on account

of severe hæmorrhage. Personally, he preferred to do it at one sitting if he found it feasible. As regards the bleeding in his case, the speaker said he referred chiefly to the arterial hæmorrhage. He was readily able to control the venous hæmorrhage by packing with a narrow strip of gauze, which was held by an assistant. By doing the operation in one sitting rather than two, we are less apt to get sepsis. The symptom of delirium, to which Dr. Erdmann referred, was present in this case.

GASTRO-ENTEROSTOMY WITH ENTERO-ENTEROSTOMY DONE BY THE AID OF THE ELASTIC LIGATURE (McGRAW).

DR. MEYER presented a man, fifty-two years old, who entered the German Hospital early last July with all the symptoms of a far advanced stricture of the pylorus. He had a large tumor in the region of the pylorus and was extremely emaciated. For about two weeks previous to his admission he had been able to retain no food whatever.

In view of the patient's desperate condition, Dr. Meyer said he intended to do a gastro-enterostomy by the McGraw method in order to complete the operation as rapidly as possible. The operation was done on July 17 last. Upon opening the abdomen, he found a large neoplasm and so many enlarged glands, that, instead of resecting the pylorus, he did a posterior gastro-enterostomy with the help of the elastic ligature of McGraw. In addition to this, he did an entero-enterostomy; and, in order to avoid complications, this was made quite close to the gastro-enterostomy, the two openings being only about five centimetres apart. On the fifth day after the operation the patient suffered somewhat from vomiting, but otherwise the recovery was uneventful.

In a second case the patient had cancer of the pylorus, and an anterior gastro-enterostomy was done on account of a short transverse mesocolon. McGraw's method was followed, and the speaker said he took special pains to attach a part of the jejunum to the stomach. After completing the gastro-enterostomy, an entero-enterostomy was done with continuous suture.

Dr. Meyer said that in doing gastro- and entero-enterostomy he has employed many devices, including the suture and the Murphy button, and he could fully indorse what Dr. McGraw has written in favor of the elastic ligature. He had found this method



Lymphangioma of the face.

extremely simple, time-saving, and very satisfactory, and he expected to continue to employ it in his future cases. According to Dr. McGraw's experiments on dogs, the parts of the gut to which the ligature is applied do not slough, but become absorbed, and after four or five days there is perfect union. Another advantage of the method is that any sized opening can be made.

LYMPHANGIOMA OF THE FACE.

DR. CHARLES N. DOWD presented a boy, six years old, with a large swelling involving the right side of the face. (See Figure.) The swelling was of firm texture, so that pressure from the fingers did not appreciably diminish its size. It seemed to involve all the tissues of the cheek, and there was no distinct line of demarcation between it and the surrounding tissue. It had been present since birth, but had been of small size until recently. During the last three years it had grown moderately, and during the last month it had grown rapidly. A piece excised for microscopical examination showed it to be a lymphangioma. Dr. Dowd asked the opinion of those present regarding treatment.

DR. DAWBARN said that while he did not think anything very brilliant could be done for the boy on account of the size of the tumor, he would first suggest extirpation of both external carotids. Then, at a subsequent period, a large portion of the redundant tissue could be removed without danger of hæmorrhage. The carotid extirpation would check the excessive nutrition and vascularity, and unless this were done he believed that the growth must continue.

DR. HOWARD LILIENTHAL said he thought some attempt should certainly be made to remedy such a terrible deformity as this by surgical means. The speaker said he would first make an attempt to remove a section of the growth with the knife, and then, if the hæmorrhage proved to be too furious, the operation could be discontinued and the wound sutured, and in that event Dr. Dawbarn's suggestion of extirpating the external carotids could be tried.

DR. JOHNSON thought it probable that an attempt to extirpate any portion of the growth would be followed by severe bleeding. The speaker said that, in a case of lymphangioma of the back which had come under his observation, the growth did not look at all formidable from the outside, but the operation proved one

of the bloodiest he had ever attempted. In Dr. Dowd's case the speaker thought that multiple punctures of the growth with either the actual cautery or the cautery needle might possibly prove effective if carried out patiently.

DR. JOSEPH D. BRYANT said that in a case of lymphangioma somewhat similar to that shown by Dr. Dowd, but in an older patient, he adopted the procedure suggested by Dr. Johnson, namely, multiple punctures with the galvanocautery. The tumor was approached from the periphery, and after a long course of treatment a cure was effected. The punctures were made from the inside of the cheek, except those directed to the lip, which were exposed as little as possible to external view. The final outcome exhibited no objectionable disfigurement.

DR. JOSEPH A. BLAKE said he had treated one case of angiosarcoma with considerable success by means of repeated puncture with the hot wire. A piece of platinum wire was soldered to two pieces of silver wire; the latter, being good conductors of electricity, do not become red-hot, as platinum wire does. The platinum wire was then inserted into the growth and the current turned on. In this way the tissues of the growth were affected without affecting the skin. Such a method might be useful in this case and would obviate scarring of the skin.

DR. DAWBARN said that Dr. Wyeth had recently treated a case similar to this one, although less extensive, by means of repeated injections of boiling water by hypodermic needle into the mass, with the object in view of clotting the blood current. That method would probably prove ineffective in a growth of this great size.

DR. MEYER said that about ten years ago he showed a boy with a large cavernoma of the cheek and lip which he treated by means of multiple punctures with the Paquelin cautery, and subsequently excised quite a large segment of the growth and brought the edges of the wound together by suturing. The speaker said that in the case shown by Dr. Dowd he favored Dr. Dawbarn's suggestion of tying the external carotids as a preliminary measure.

PROSTATECTOMY BY THE PERINEAL ROUTE.

DR. PARKER SYMS read a paper with the above title.

DR. JOHNSON said his rather limited experience in prostatectomy would lead him to indorse very fully the conclusions drawn by Dr. Syms not only in regard to the desirable character

of the perineal route, but also as to the usefulness and speed of the operation. By the method referred to the hæmorrhage is slight, there is little apparent shock, drainage is comparatively perfect, and the danger of sepsis is minimized.

The most important conclusion that may be drawn from the experience of surgeons up to the present time in regard to prostatectomy is that, if the operation is to be a safe one, it should be done at a rather early stage of the prostatic enlargement. In fairly healthy individuals, whose blood-vessels are not notably degenerated and with a fairly sound heart and kidneys, prostatectomy may be done with almost no mortality. On the other hand, if the patient is suffering from a severe cystitis; if he has emphysema, with degeneration of the cardiac muscles; if there is advanced atheroma or nephritis, then the operation becomes exceedingly formidable, and under such unfavorable conditions the speaker said he was inclined to believe that some of the less radical operations were safer and more satisfactory.

DR. GEORGE WOOLSEY said that while he was practically in accord with the conclusions drawn by Dr. Syme, he could not indorse the statement made in regard to the suprapubic incision. He did not think such an incision was any more dangerous in prostatectomy than when it is done for stone in the bladder. It can be entirely closed with a fair degree of certainty, or it can be left open for drainage, and the closure of the resulting fistula is usually complete and speedy. Such an incision is not only comparatively free from danger, but offers decided advantages. In a case of prostatectomy upon which the speaker operated last summer he discovered a large stone in the bladder, the presence of which he would not have suspected but for the suprapubic opening. Furthermore, it would have been difficult to remove it by the perineal route on account of its size. The opening above the pubes is certainly safer than a laparotomy.

As far as the removal of the prostate is concerned, Dr. Woolsey said he was in favor of removing it through an incision from the outside rather than from the inside of the urethra. Although in the former method the urethra may be opened, the latter method often results in extensive laceration of the urethra. In three of Dr. Syme's cases, the incontinence of urine following the operation may be partly explained by assuming that the fibres of the prostatic urethra were torn and not properly repaired.

DR. DAWBARN said the method advocated by Dr. Syms was very simple, and seemed to be a great advance in operating on the prostate. The speaker said he had employed the method in two cases. The first proved successful, but the second, performed at the Hartford Cancer Hospital, was a failure owing to the fact that the apparatus did not prove sufficiently strong and broke in the course of the operation. Instead of employing a distensible bulb of rubber, as Dr. Syms does, Dr. Dawbarn suggested, in order to prevent such accidents, that a stout textile fabric, such as thin but closely woven silk covered with rubber, be substituted.

DR. LILIENTHAL suggested a jointed metal instrument, like the Otis urethrometer, which could be screwed up to the desired size without fear of breakage or collapse.

DR. WILLY MEYER said that in recent years he has repeatedly attacked cases of chronic gonorrhœal prostatitis by the perineal route, making the ordinary transverse incision and adding a short median incision. In this way we can easily enter between the urethra and rectum and gain access to even a comparatively small prostate and clean it out thoroughly.

As regards prostatectomy by the perineal route, Dr. Meyer said his experience is limited to a single case, upon which he operated two years ago for a suppurating prostate. During the past three years, the speaker said that in the treatment of enlarged prostate he has limited himself to one method, namely, the Bottini method, in order to fairly estimate the true value of the operation. He has now operated by this method in fifty cases with extremely favorable results, in spite of the fact that in the majority of the cases the gland was very large and fibrous in character. It is particularly advantageous, however, in cases of extremely small, spongy prostates, which prove difficult and bloody operations if attacked from above.

DR. SYMS, in closing the discussion, said he was convinced that the instrument he had shown possessed many advantages over a hard instrument, although it was by no means perfect. The speaker said he agreed with Dr. Johnson that perineal prostatectomy usually causes very little shock, and recovery from the operation, as a rule, is rapid. He could not agree with Dr. Woolsey in regard to opening the bladder above the pubes. In these cases it is not like a simple operation for stone or tumor: we are dealing with old men who are liable to infection, and we

cannot avoid a certain amount of soiling of the prevesical space. When suppuration does occur there, the region is very difficult to treat or drain. All this is avoided by the perineal operation.

Dr. Syms said that in two of his cases stone was present. One was a large stone which could not be removed through the perineum without crushing, which was done. In the other case, five small stones were taken out through the prostatic urethra. In those cases where the prostate is small, enucleation is much more difficult than where it is large.

ACUTE INTUSSUSCEPTION.

DR. JOHN F. ERDMANN presented a specimen with the following history. The patient was a child with complete intestinal obstruction. When Dr. Erdmann was called to see the case, the condition of the patient was very fair. The temperature was 100.5° F.; pulse, 128. There was a very slight amount of tympanites, and no mass could be felt by the rectum or by abdominal palpation. Two enemas had been given, which brought away nothing but some bloody mucus. Even under anæsthesia, no mass could be felt. An operation disclosed an intussusception of twelve inches of gut, the apex of which presented in the ileo-cæcal valve. There was some difficulty in reducing it, and just as this was accomplished there were two spurts of fæcal matter from two gangrenous ulcerations. An end-to-end anastomosis was done, but the case terminated fatally.

Dr. Erdmann said he thought the true symptoms in this case had been masked by the small doses of opium which had been given for a few days preceding the operation. In over 50 per cent. of these cases, the speaker said, no tumor can be palpated.

Stated Meeting, November 27, 1901.

The President, L. W. HOTCHKISS, M.D., in the Chair.

DUODENAL ULCER TREATED BY GASTRO-ENTEROSTOMY.

DR. WILLIAM B. COLEY presented a man, aged fifty-one years. For fifteen years he had suffered more or less from indi-

gestion, but in general his health had improved, except an attack of typhoid fever four years ago, after which he never felt perfectly well. During May and June, 1900, he had very severe attacks of indigestion accompanied by frequent nausea and vomiting, but the vomitus never contained blood. These attacks never seemed to have any reference to eating; he was always troubled with hyperacidity. During the summer of 1900 he had several attacks similar to the foregoing, although shorter in duration, lasting from three to four days. In October, 1900, he had another severe attack lasting one month. His weight, which had fallen off during the previous attacks, now fell to below 100, his normal weight being 136 pounds. He recovered sufficiently from this last attack to return to business, although he had to be extremely careful in diet, and lived principally upon liquid food.

On March 10, 1901, he was suddenly seized with dizziness while walking, and fell to the ground. During the same night he vomited upward of a pint of dark blood mixed with some mucus. He also passed a large amount of dark blood by rectum the same night. His temperature was 100.8° F.; pulse, 97. On the following day, March 11, he had four stools, consisting chiefly of blood and mucus. Temperature was 100° F.; pulse, 100. On March 13 he vomited one-half pint of dark blood, and had repeated attacks of vomiting during the day; the vomitus always contained blood. On the 14th his condition remained about the same as the preceding day. On the 16th, Dr. Coley saw him in consultation with Dr. A. C. Benedict, of Yonkers. Physical examination at this time showed the patient considerably emaciated and profoundly anæmic. There was well marked distention of the abdomen, which rendered palpation of little value. There being a reasonable probability that the affection was an ulcer, either of the pylorus or duodenum, a continuation of the very careful treatment that he was already having with nutrient enemata was advised. Between March 16 to 26 he somewhat improved in strength: his pulse fell to 80, with a temperature of 97° F. He continued to improve until April 11, when, for the first time, he was allowed solid food. A few hours after taking solid food he vomited a large amount of dark blood and mucus. On the 16th of April he passed what was estimated to be three quarts of dark blood and mucus by the rectum. He was again put on nutrient enemata and ice by the mouth. As soon as he

recovered sufficient strength to be removed, he came to New York and entered the General Memorial Hospital on the 22d of April. No attempt was made to give him any food by mouth, and his condition was considerably improved since the time when first seen by Dr. Coley in March, although he was still exceedingly weak and emaciated. The distention had nearly disappeared.

Operation was performed on the 24th of April, under ether anæsthesia. The stomach was found somewhat dilated, but careful palpation showed no apparent thickening of the wall of the stomach or pylorus. Just beyond the latter, in the first part of the duodenum, could be made out a small, hard mass about the size of a hickory nut; no enlarged glands could be detected. The condition of the patient was not such as to warrant any attempt at exploring or removing this mass, and, believing it to be probably thickened tissue resulting from ulceration, an anterior gastro-enterostomy was rapidly done with the aid of Murphy's button. The patient recovered extremely well from the shock of the operation, a temperature of 100° F. the day following the operation being the highest recorded. It fell to normal the second day, and recovery was uninterrupted. The nutrient enemata were kept up for two days, and then, at the end of the second day, a little hot water was given by mouth, and on the third day, one-half ounce of thin chicken broth was given. The patient left the hospital three weeks after operation, eating well and gaining rapidly in strength. During the first three weeks after leaving, the gain in weight was seven pounds each week. His weight soon returned to normal, about 136 pounds, and he has continued his business as a lawyer ever since.

NEPHRECTOMY FOR TUBERCULAR KIDNEY.

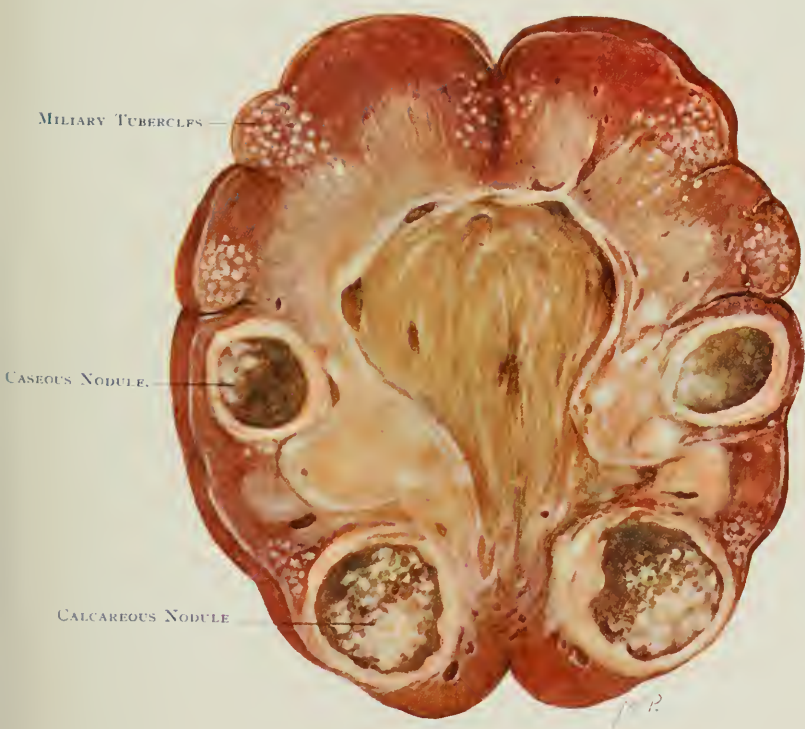
DR. CHARLES N. DOWD presented a girl, nine years old, with a good family history, who was first admitted to St. Mary's Free Hospital for Children on October 31, 1898, for a cold abscess in the region of the right kidney, which was incised, and which healed in about three weeks. She left the hospital, January 1, 1899, giving no evidence of tubercular disease in any of the bones or internal organs. She was again admitted to the hospital on October 9, 1899, with the symptoms of vesical irritability. About three months previous to her admission she began to have pain in the

region of the bladder, which was worse at night, and was often not present at all during the day. She had painful and frequent micturition and slight tenderness in the right iliac fossa. The urine was cloudy, alkaline, specific gravity 1018. It showed no albumen by the heat and nitric acid test, but contained a number of pus and epithelial cells and oxalate of calcium crystals. On October 10 she had a severe attack of pain which lasted about half an hour; it seemed to be localized in the urethra, and was accompanied by frequent desire to urinate. During the day there was a feeling of more or less discomfort in the pelvis, which became worse at night. On October 21 she had a similar attack, which lasted about an hour. Under the administration of urotropine her condition gradually improved, and she was discharged from the hospital on November 19, 1899. Her urine at that time was normal; it contained no tubercle bacilli.

Sixteen months later, March 20, 1901, she was admitted to the hospital for the third time. In the meantime her health had been good until about two weeks previously, when she began to suffer from severe pain in the lower right side. It was not constant, and was much aggravated by exercise. Her urine contained much pus and albumen. She was sent to Dr. F. Tilden Brown for ureteral catheterization. He reported that five cubic centimetres of urine were secreted from the right kidney in fifty minutes; specific gravity 1013; $\frac{9}{10}$ per cent. urea; pus and tubercle bacilli were found; albumen present. From the left kidney there were six cubic centimetres in thirty minutes; specific gravity 1023; $\frac{16}{10}$ per cent. urea; faint trace of albumen; no pus; no tubercle bacilli.

The effect of climatic treatment was tried during the summer, but she returned in the autumn without material improvement. Her urine, October 8, was acid; specific gravity 1020; 10 per cent. albumen by bulk; it was cloudy, and contained a marked sediment. The microscope showed many pus and epithelial cells and a few granular casts; no tubercle bacilli were found. The daily amount was about twenty-two ounces.

October 25 nephrectomy was done by Dr. Dowd. An oblique incision was made from the lower border of the twelfth rib towards the anterior superior spine of the ilium, five and one-half inches in length. The kidney was drawn out and removed, together with one inch of the ureter. The wound was closed, with



Tubercular kidney, showing calcareous nodule, caseous nodule, and miliary tubercles.

the exception of a small drain at the upper angle. Recovery has been uninterrupted. On the day after the operation, thirteen ounces of urine were passed; on the following day, nineteen ounces. The daily amount is now twenty-four to twenty-eight ounces; it is clear, acid, about 1015, and contains no albumen and no casts. The patient's general condition is excellent, her nutrition is good, and she seems well and strong.

The condition of the kidney which was removed is remarkable, as is indicated in the accompanying plate. At the lower pole there is a calcareous nodule nearly an inch in diameter, which is firmly enclosed in a fibrous capsule. It probably represents the remains of the first tubercular inflammation which occurred three years ago, and which caused the perinephritic abscess. About the middle of the cortex there is a caseous tubercular nodule not quite so large, which is also incapsulated. Scattered throughout the cortex there are numerous groups of miliary tubercles. The ureter was normal both in gross appearance and on microscopical examination of the excised portion.

It is worthy of note that, although repeated examinations of the urine were made for tubercle bacilli by careful and competent men, they were found only once.

Dr. Dowd said he did not feel sure that the opposite kidney was entirely healthy, although neither the urine nor her general health gave any evidence of disease there. It is difficult to believe that one kidney would remain entirely healthy while the other was so extensively tubercular. The child had shown considerable power in resisting tubercular disease, and if there were any tubercular foci in the other kidney or elsewhere there was good reason to hope for their cure under suitable climatic and hygienic treatment. The hospital had therefore arranged to give her the benefit of suitable climatic treatment for another year.

DR. ELLSWORTH ELIOT, JR., said that Dr. Dowd, in reporting his case, made the statement that he was surprised at the extent of the lesion in the removed kidney, in view of the fact that there were apparently no other tubercular lesions present elsewhere in the body. This, Dr. Eliot said, is the rule rather than the exception in cases of tuberculosis of the kidney. In one of his cases of nephrectomy for this condition in the Presbyterian Hospital some six years ago, the kidney was found to consist of a large number of purulent foci, some communicating with each

other; and when the largest of these pus sacs had been emptied by aspiration the kidney still measured eight inches in its vertical diameter and about four inches transversely. Notwithstanding the extent of the tubercular lesion in this case, the patient has apparently remained perfectly well up to the present time, and four years after the operation she gave birth to a child without any disturbance of the opposite kidney. In another case where nephrectomy was done a year ago last April, the kidney lesion was a very extensive one, with broken-down purulent foci. In spite of this, and of the fact that, prior to the operation, the patient had grave constitutional symptoms of sepsis, with a high pulse and temperature, he made an uninterrupted recovery. Since the operation the man has gained forty-five pounds in weight, and has resumed his work in this city. Even in those cases where the tubercular lesion has extended beyond the kidney into the bladder, and possibly further invading adjacent organs, marked improvement has followed the removal of the affected kidney. Such cases have been reported by König.

The above facts, Dr. Eliot said, rather lead us to the conclusion that the operative treatment of tubercular kidney should be extended to limits that not many years ago were regarded as contraindicating an operation. Even the involvement of both kidneys does not necessarily contraindicate the removal of the one more extensively diseased, provided that the urine which is secreted by the remaining kidney does not show marked pathological changes. It should be moderately clear, with few leucocytes, and should not contain an excessive number of tubercle bacilli.

DR. F. TILDEN BROWN, who had performed catheterization of the ureters in the case shown by Dr. Dowd, said it had occurred to him that the tissues of this child were possibly immune to infection because of the long-continued drainage of this tuberculous kidney; this fact might also explain the exemption of the ureter and bladder from infection. Another point of interest was the probable relationship between the old lumbar abscess and the kidney tuberculosis. This abscess antedated the nephrectomy by three years, and the remains of it were probably seen in the calcareous mass which was found at the lower pole of the kidney. This showed unmistakably nature's attempt at repair, and Dr. Brown said it was the first lesion of the kind he had ever seen in

the kidney. The speaker said he agreed with Dr. Eliot that Dr. Dowd need not anticipate any recurrence of the disease either in the remaining kidney or elsewhere in the body, unless the child is forced to live under unfavorable hygienic conditions. There is no doubt that greater freedom is exercised to-day than formerly in the operative treatment of tuberculosis of the kidney. Of this fact, the following case is an illustration. About a year ago the speaker was consulted by a young man of twenty who had been under the observation of a leading surgeon in this city, who had made several ineffectual attempts to catheterize the ureters in order to ascertain in which kidney the tubercle bacilli which were present in the urine originated. An attempt that had been made under spinal cocaine anæsthesia failed on account of a marked tremor of the legs while the patient was under the influence of the anæsthetic. Dr. Brown said he found the patient the most unpromising case for ureteral catheterization that he had ever met with. The posterior urethra was extremely irritable, and the entire urethral canal was contracted. In addition to this, there was a rapid reaccumulation of purulent urine in the bladder. After about a month's preliminary treatment of the urethra and bladder, he succeeded in introducing a catheter into the ureters. From the left kidney perfectly clear urine was withdrawn; that from the right kidney contained many tubercle bacilli. The latter organ was enlarged and the corresponding ureter was tender. He also had tender spots in the seminal vesicles and prostate.

The patient was sent to the country for the summer, where he gained at first, and then had a relapse and suffered much from pain. He lost ground rapidly; so much so, that he insisted on having something done. As a nephrectomy did not seem justifiable, on account of the man's poor condition, the right ureter was severed through an abdominal incision, and then the kidney was allowed to drain through a lumbar incision. This was deemed advisable as a temporary expedient, in order to give the patient an opportunity to recuperate. The operation proved a lengthy and arduous one, on account of the ureteral attachments; but the patient recovered promptly from its effects and the kidney drained freely through a good-sized ureteral catheter. The patient, however, instead of being benefited by the operation, steadily continued to lose ground. He had a high fever, night sweats, and continued loss of weight. It was finally decided to remove the

kidney entirely, and as soon as this was done the patient began to improve. His temperature dropped from 103°, 104°, and 105° to 100° F., and he is steadily gaining in weight. This patient, Dr. Brown said, probably has multiple tuberculous foci in his system; but in spite of this he was distinctly benefited by removing the chief source of the infection, and he is steadily gaining ground.

DR. GEORGE WOOLSEY said the partly healed tuberculous foci in the kidney shown by Dr. Dowd was very interesting and encouraging, as indicating what was possible in renal tuberculosis. It called to mind a case of genito-urinary tuberculosis which the speaker now has under observation. This patient had a tuberculosis of the prostate, which has now undergone fibrous contraction and hardening; but it is still a question whether his kidney is involved. It is three years since his trouble began, and he is now under climatic treatment. His condition has improved generally and locally; although he still suffers from frequent mic-turition and the urine contains numbers of tubercle bacilli.

DR. HOWARD LILIENTHAL said it has been, and still is, his custom to remove a bad tuberculous kidney without regard to the absolute health of the opposite kidney. In Dr. Brown's case, for example, the affected kidney could probably have been safely removed at the outset. It was enlarged and palpable, while the opposite kidney was secreting clear urine.

DR. WILLY MEYER said it was often very difficult to learn which of the kidneys is diseased, especially when the bladder is so much contracted that we cannot perform cystoscopy satisfactorily. Two years ago, the speaker said, he saw a man who complained of continuous pain on the right side. As his urine contained tubercle bacilli, it was naturally inferred that his right kidney was diseased; but when cystoscopy was finally accomplished, it was found that the infected urine came from the left kidney, and an operation proved that this was the tuberculous one. Such a case illustrates the fact that the location of the pain cannot always be relied upon.

When it is utterly impossible to perform cystoscopy in order to make a correct diagnosis, we must cut down upon the suspected kidney or do a cystotomy. Dr. Meyer said he was very much afraid of a suprapubic cystotomy in tuberculous cases, as it is apt to result in a persistent and annoying local fistula.

Cases in which both kidneys are apparently equally diseased

must of course be regarded as incurable from an operative standpoint, but when one kidney is much diseased and the other only slightly, the patient will probably be benefited by removing the former. It will certainly improve the tenesmus and other grave symptoms.

DR. BROWN said he could not agree with Dr. Meyer as to the efficacy of cutting down on a tuberculous kidney for diagnostic purposes. A kidney may be very much diseased without giving any external evidences of the fact, for the reason that the vessels are more or less compressed, and we are not apt to get a congestion or find cortical lesions. In the case presented by Dr. Dowd, palpation would hardly have shown the calcareous deposit of broken-down tuberculous nodule.

NEPHROTOMY FOR RENAL CALCULI.

DR. CHARLES N. DOWD presented a man, twenty-six years old, of good physique, who enjoyed good health until 1896, when he passed two calculi, one the size of a pea, the other smaller. He was then in good health until August, 1899, when he had an attack of urethritis which was very persistent. He was under continual treatment for five months. During the latter part of this time he had much pain in the prostatic region, necessitating bladder irrigations. This pain recurred in April, 1900, and was accompanied by great frequency of micturition. He came to the General Memorial Hospital on May 14, 1900. At that time his bladder capacity was two ounces, and micturition was necessary at least every two hours. The urine was acid; it contained a sediment which was chiefly composed of pus and mucus, and which was about 8 per cent. of the bulk of the urine; there was 5 per cent. albumen by bulk in the clear urine above this sediment. Microscopically, there were many leucocytes, epithelial cells, and urates. Under bladder irrigations, rest in bed, and medication the bladder capacity increased to twelve ounces in the course of two months, and the nocturnal micturitions were reduced to one or two.

On September 18, 1900, he returned to the hospital, complaining of a constant desire to urinate, with pain and discomfort about the neck of the bladder. These attacks came on at variable intervals. He sometimes had a burning sensation in the bladder and penis, and at times the urine was streaked with a

very little blood. A cystoscopic examination was made with a negative result. The bladder irrigations were followed by improvement, as before.

On November 1 he went under treatment in the Out-Patient Department, from whence he was referred in the following February to Dr. Bierhoff, who catheterized the ureters and found a pyelitis of the left kidney. He irrigated the pelvis of this kidney with dilute nitrate of silver solution. In May the patient had a severe attack of cramp-like pain in the region of the left kidney, radiating downward to the pelvis. Three weeks later he had a similar attack. About July 1 the catheter in the pelvis of the kidney struck something hard and gritty to the feel, and this was followed by hæmorrhage. An X-ray picture was then taken, which disclosed the presence of a calculus in the kidney.

Operation, July 29, 1901. An oblique incision was made from the margin of the twelfth rib at the edge of the erector spinæ outward and downward. The kidney was brought out of the wound and palpated, but no calculus could be felt. An incision was then made through its convex border, and upon inserting the tip of the finger two calculi were felt in the lower pole of the kidney. As they could not be removed through the incision without the danger of leaving a part of it behind, they were pushed against the cortex and a small incision made, through which it was pushed. The calculi were rough, angular, and irregular in shape, and contained uric acid and oxalate of calcium. The largest one was $\frac{9}{16} \times \frac{3}{8}$ inch, and the smaller, $\frac{3}{8} \times \frac{3}{16}$ inch. They weighed thirteen and a half grammes.

The incisions in the kidney were packed, and the patient made a satisfactory recovery from the primary effects of the operation, and did very well for three or four days. Blood then began to ooze through the external wound, and on the tenth day this was excessive, but finally ceased on the use of suprarenal extract applied within the wound and given internally. He belongs to a family which has suffered from hæmophilia at various times. He left the hospital four weeks after the operation; he has improved steadily, and is now in good health. His urine is almost normal, but still contains a few pus-cells and a little albumen.

In considering his symptoms, one wonders that he should not have passed more blood in the urine. With the exception of a very few faint streaks, there had been no blood seen in the

urine until the ureteral catheter impinged upon the calculus and moved it.

DR. ELIOT said the use of the X-ray for the detection of renal calculi had to some extent modified the treatment of these cases. Before the introduction of the Röntgen rays, it was considered advisable to incise the kidney along its convex border and make a thorough search for multiple calculi, not only in the pelvis, but in the parenchyma itself; but, now that we can usually determine whether we have to deal with one stone or several, as well as their relative position, incision of the pelvis of the kidney simply, rather than exposure of the pelvis by cutting through the kidney tissue, seems preferable. In this way we can avoid the possibility of severe hæmorrhage, and also lessen the danger of subsequent infection. Furthermore, it allows us to remove the stone quickly, and there is less likelihood of a renal fistula. Dr. Eliot said he had not seen a renal fistula persist in any of his cases for more than five or six weeks after the operation.

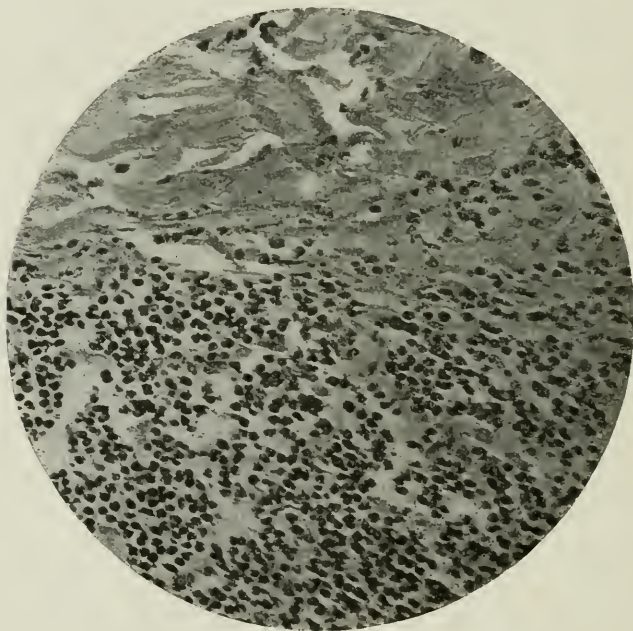
SMALL, ROUND-CELLED SARCOMA OF THE PAROTID SUCCESSFULLY TREATED BY THE MIXED TOXINS OF ERYSIPELAS AND BACILLUS PRODIGIOSUS.

DR. WILLIAM B. COLEY presented a man, fifty-five years of age, who first noticed a lump in the right parotid region in November, 1899. He paid very little attention to it at first, but, as it increased in size, consulted Dr. J. D. Rushmore, of Brooklyn, who advised extirpation. The tumor had reached the size of a walnut, and in further consultation with Dr. W. T. Bull operation was decided upon and performed by Dr. Bull, April 5, 1900. Dr. Bull found the growth apparently originated from one of the outer lobules of the parotid gland. No attempt was made to excise the whole parotid, as it was thought wise to try to save the facial nerve. The larger part of the growth was apparently encapsulated, but there was a portion that was not, the latter containing a larger amount of fibrous tissue. It was impossible to remove the entire tumor without sacrificing the parotid gland and the facial nerve.

The pathological examination by Dr. M. P. Denton showed the growth to be a small, round-celled sarcoma. Shortly after this a local recurrence was noticed, and this steadily increased in

size until October 1, when it was decided by Dr. Bull that further operation was unadvisable. He recommended the erysipelas toxins, and referred the patient to Dr. Coley for treatment.

The treatment was begun on October 5, 1900, and, with toxins prepared by Dr. B. H. Buxton at the Cornell Laboratory, continued in daily injections for about one month. The patient was never able to bear more than two to three minims. The reactions were moderate, temperature ranging between 99° and 102° F. At the end of this time no very marked change had



Small, round-celled sarcoma of the parotid.

taken place, and Dr. Bull felt inclined to doubt the advisability of further continuing the treatment. There was, however, a slight diminution in size and increase in mobility, and the tumor seemed less fixed to the deeper structures. The injections were kept up five to six times a week during the entire winter. After three months' treatment, the improvement was more marked, and in February, 1901, the growth began to diminish in size more rapidly. By April 1 it was not more than one-quarter its original size, and on the 1st of June it had apparently entirely disappeared. Fre-

quent examinations since showed no trace of the tumor, and up to the present time, November 27, there is absolutely no evidence of the original growth. The patient has remained in perfect health during the entire time, and has not been confined to his bed at all during treatment. Only moderate reactions were aimed at, and on but three or four occasions did the temperature rise above 103° F. He averaged about three slight chills a week. He was treated the greater part of the time at the office, going at once to a hotel, and two hours later taking the train for home, thirty miles distant. It should be noted that he gained in weight and strength and general health under treatment.

This case is of very great interest, as it adds an additional case to the list of round-celled sarcomas successfully treated by the toxins, and makes the third case of inoperable recurrent sarcoma of the parotid gland that has yielded to the toxin treatment in the hands of Dr. Coley. Two of these three cases are still well four and five years respectively, and in all three of the cases the diagnosis was placed beyond question by the fact that, in addition to a microscopical examination by competent pathologists, there was also the history of repeated recurrences in two cases and a rapid recurrence in the third. The diagnosis in the present case is sustained by the careful examination of Dr. B. H. Buxton, whose report is as follows:

"The tumor of the parotid is a small, round-celled sarcoma invading the interglandular connective tissue. The cells lie in large masses, and among them run numerous immature capillaries, and to a great extent they have degenerated, as indicated by the granular appearance of the nuclei and loss of staining properties. Remnants of the glandular tissue can be observed here and there. The histological appearance of the tumor indicates extreme malignancy."

The tumor was also submitted for examination to Dr. William H. Welch, of Johns Hopkins University, who reports as follows:

"The section is a specimen which appears to have been hardened in alcohol and is stained with hæmatoxylin and cosin. It is mounted in balsam, most of the section is composed of densely packed, small, round cells; in some places there is a dense fibrous stroma, and the remains of an acinous gland invaded by the tumor cells are present near one edge of the section. The

cells composing the tumor are uniform in size and shape, being small, mononuclear cells of the lymphoid type with scanty cytoplasm. They are in most parts of the section in close opposition, with very little demonstrable stroma, and without any definite architectural arrangement. There are a few medium-sized blood-vessels with muscular walls, and here and there are strands of small masses of dense sclerotic fibrous tissue, in which clumps or islands of the small tumor-cells are present. The fibrous stroma constitute a relatively small part of the new growth, which in general is very cellular. The glandular elements are present in a small area, and are in the form of small acini and tubules lined by cubical epithelium resembling those of the parotid gland. These glandular remnants are pressed apart and invaded everywhere with small, round cells of the same characters as those throughout the tumor, and there is no capsule or other demarcation between the glandular part and the rest of the tumor. It is evident that the gland has been largely destroyed and replaced by the tumor.

“Diagnosis, small, round-celled sarcoma.”

Dr. Welch further states as follows: “There can be no dispute about the diagnosis. It is not one of those sarcomata which simulate chronic inflammatory tissue, nor can it be a hyperplastic or inflamed lymphatic gland adjacent to the parotid. The appearances all indicate a sarcoma originating in the parotid gland itself. Histologically, the new growth is malignant. Indeed, it seems highly malignant, composed, as it is, of closely packed, small, round cells.”

In reply to questions, Dr. Coley added that in the treatment of such cases he always began with a minimum dose, because the susceptibility to the toxins differs in every case. In the treatment of vascular growths he begins with a quarter of a minim, and gradually increases the dosage until the desired reaction is obtained, that is, until the temperature rises to 102° or 103° F. When the injections are made at a point remote from the tumor, he usually begins with a dose of one minim. He had generally employed during the last eight years toxins prepared for him by Dr. B. H. Buxton, of the Cornell Medical College. Parke, Davis & Co. also have had a preparation on the market for the past two or three years which is of about the same strength as that of Dr. Buxton. The cultures from which the toxins are made

must be of a high degree of virulence in order to produce toxins of value. The best results have been obtained when injections are made directly into the tumor; though Dr. Coley and others have reported cases in which it was impossible to inject into the tumor, and yet the tumor disappeared entirely, and the patients remained well more than three years.

HYDATID OF THE LIVER.

DR. JOHN ROGERS presented a man, twenty-two years old, who entered the medical side of Gouverneur Hospital on September 22, 1901, with a temperature of 104° F. Upon examination, a tender tumor was found in the region of the left lobe of the liver, together with some enlargement of the right lobe. A diagnosis of gumma of the liver was made, and the patient was treated with potassium iodide. During the next three days his temperature subsided and reached the normal on the fourth day, remaining so until October 3. A small tumefaction remained in the region of the liver, but the tenderness largely disappeared. On October 4 his temperature again rose to 104° F. and the tumor became more prominent. A diagnosis of empyema of the gall-bladder was made, and operation advised, and at first refused. Gradually, the abdomen became much distended, and the patient's temperature rose to 106° F.; pulse, 130. There were evidences of considerable sepsis. After opening the abdomen, the tumor was aspirated, and a non-purulent fluid withdrawn, which upon examination was found not to contain any of the characteristic hooklets of an echinococcus cyst. After stitching the edges of the abdominal wound to the surface of the liver around the tumefaction, the latter was opened and drained. While inserting the stitches, several small punctate abscesses were opened by the needle in the surface of the liver, seeming to indicate a suppurative cholangitis. The gall-bladder was much distended, but the condition of the patient was such that it was not considered advisable to prolong the operation by opening it. After the first day or two, quantities of the characteristic daughter cysts were discharged from the wound, thus establishing the character of the disease. The patient made an uneventful recovery.

TRANSACTIONS OF THE CHICAGO SURGICAL SOCIETY.

Stated Meeting, December 2, 1901.

The President, CHRISTIAN FENGER, M.D., in the Chair.

CLINICAL AND EXPERIMENTAL SURGERY OF THE LIVER.

DR. CARL BECK read a paper on this subject, in which he stated that clinical and experimental surgery of the liver was still in a state of experimentation. The author had experimented for years, and had followed first the methods indicated by others, then original methods. During the period that Bianchi and Ceccherelli experimented with partial interrupted suture over whalebone, he tried suture over the liver in the same manner with decalcified bone. He demonstrated some specimens from dogs before the Chicago Medical Society four years ago. The result was that bone and sutures at the submerged stump of the liver suppurated, and the localized abscess broke into the bowel. Three months ago a case of large adenoma of the left lobe of the liver came under his care. He was obliged to resect about two-thirds of the liver, and to use the extraperitoneal method with elastic constriction in this case. The patient recovered and was in good health when shown before the Chicago Medical Society two months after operation. This case prompted the author to experiment again, and he has tried now a method to operate on pediculated tumors or parts of the liver by an intra-abdominal method. He used the abdominal fascia and peritoneum, or even the muscle, as strips to surround the pedicle of the liver to be resected, passed the sutures through the fascia and liver, and thus prevented the cutting through of the ligatures through the friable liver tissue. Four dogs were operated in this manner, and large lobes of the tissue removed. The technical part was easy, allowed

intramural embedding of the stump, prevented hæmorrhage, and allowed closure without drainage. A specimen from one of the dogs showed the liver to be lightly embedded in the abdominal wall. If tension of the fascia would not allow the sutures to be pulled tight, the fascia and peritoneum with muscle might be cut in a tongue-shaped flap, and thus made freely movable when used as an elastic living constrictor, which would render good service.

DR. JACOB FRANK stated that in 1891, at the Cook County Hospital, he removed a large sarcoma of the liver from a woman. The patient recovered. It was one of the first sarcomas of the liver removed in this country. A short time ago he removed quite a large tumor embedded in the centre of the liver. The specimen was submitted to Dr. Maximilian Herzog, pathologist to the Chicago Policlinic, for examination, who thought it was a primary endothelioma. He mentioned these two cases to contrast the difference between the condition described by the essayist and one which would call for a different operation; for if the tumor was situated in the centre of the liver tissue, he thought it would be impossible to draw out the liver and resect portions of it as described by the essayist. However, the method described by Dr. Beck, where the tumor was situated in the lower and superficial part of the organ and could be drawn out and tied off, was all right, but could not be done in tumors situated deep in the liver tissue. Livers that had ruptured in accidents had been sutured, and quite a number of such cases have been reported. He thought it would be better to use decalcified bone in uniting the liver substance after a resection had been made than whale-bone. Surgery of the liver is quite discouraging, and hæmorrhage during operations on that organ very profuse, and in the sarcoma case he had to pack and keep on packing constantly during the operation, but after the tumor was removed the bleeding ceased. Fully a pint of liver substance from his last case was curetted away.

DR. DANIEL N. EISENDRATH thought it was difficult to deduce conclusions from experiments on the livers of dogs as to the advantages of the method proposed by the essayist, for the reason those who had worked on the livers of dogs would acknowledge that they had a great many lobes. Furthermore, the liver of the dog was so mobile that one could pull it half-way down the abdominal cavity, and consequently it would not resen-

ble the condition which was found in the human being in the presence of a tumor.

Another point which occurred to him in regard to this method was whether there would not be great difficulty in extirpating large tumors by this plan, for instance, a tumor larger than an egg in size, which could be brought readily through the abdominal incision, and whether there would not be great danger of hernia on account of stripping off of the fascia, and perhaps a portion of the rectus muscle, and peritoneum.

DR. BECK, in closing, said it was possible to turn the liver out of the abdomen. After the stomach was separated from the tumor, and the suspensory ligament cut, the tumor could be turned out from the abdominal cavity clear to the healthy tissue. A small portion of the gall-bladder separated downward marked the healthy from the pathological tissue, and here the elastic ligature was applied.

As to operations on the liver for malignant disease, he said that Dr. Keen had tabulated them. There were seventy-seven cases of operations on the liver up to 1899, and since then about twelve additional cases, his included. Of this whole number, some of the cases belonged to the classification of hydatids of the liver. He regretted that Dr. Frank had not published his case, because it was claimed in the literature that Dr. Luecke's case, which had been operated on in 1893, was one of the first, and the case of Israel, which lived 110 days after the removal of a sarcoma of the liver, was one of the very few. Operations for sarcoma of the liver were very rare as compared with those for carcinoma. The prognosis was very much worse, so that if Dr. Frank's case had been published it would be unique. The case of Luecke was proven by Madelung to be one of syphilis of the liver.

In regard to the mobility of the liver in dogs, his experiments applied only to tumors which were partly pedunculated and could be removed through an abdominal incision. The suspensory ligament could be slit clear down, and by means of a thoracoplastic operation, or Lannelongue's incision, the whole liver could be gotten out from the abdominal cavity, if necessary, except in so doing one was very apt to lacerate the large vessels. He stated that Dr. Ferguson had reported a case in which he removed a tumor of the liver where there were only a few ounces of liver tissue left.

As to the occurrence of hernia, inasmuch as this applied only to malignant growths or tumors which were very large, the question of hernia was absolutely irrelevant.

DR. FRANK asked whether the essayist had ever cut out a V-shaped piece of the liver in a dog and brought it together; to which Dr. Beck replied that he had made V-shaped incisions in the liver, and then sutured the organ, first doing preliminary ligation, but all the sutures tore through the liver tissue. The sutures did not tear through if they were superficial. He had applied this suture once in a case of gunshot wound with a bleeding laceration of the liver border.

ABSCESS OF SARCOMATOUS KIDNEY SIMULATING APPENDICITIS.

DR. WILLIAM M. HARSHA described the history of a man, forty years of age, who, having for some time presented the usual evidences of a large appendiceal abscess, became the subject of its rupture, and consequent general peritonitis, for which he was brought to hospital and operated upon. Incision was made over the site of the appendix. On going through abdominal wall, a solid mass was encountered which was adherent to the parietal peritoneum. Following downward and inward, pus and coagula of blood, with broken-down tissue, which looked like liver, were met with in the free cavity of peritoneum. The incision was enlarged and cavity cleansed; the lower end of tumor was broken down. Gauze was so placed as to protect the peritoneal cavity, and drainage tubes were inserted into the hollow of the sacrum and transversely through the abscess cavity. When the tumor was incised above the abscess cavity, the tissue appeared light in color and fibrous in character. Patient was almost in collapse, and, although pus drained freely, vomiting continued, and bowels remained paralyzed; the patient died early the next day.

Post-mortem examination revealed the tumor to be a greatly enlarged kidney, with ruptured abscess cavity at the lower and outer portions, adherent to abdominal wall and to a part of the colon. The intestines were œdematous and covered with plastic lymph; appendix normal; opposite kidney enlarged, and showed degenerative changes, but was not examined microscopically. Heart normal. There was no stone in the diseased kidney, but the

normal structure appeared totally destroyed. Microscopically it was pronounced fibrosarcoma.

DR. DANIEL N. EISENDRATH spoke of a case which came under his observation at the County Hospital. The woman was admitted on the medical side in a moribund condition, a diagnosis having been made of appendiceal abscess. The patient was twenty years of age. She was transferred to the surgical side, and when he saw her she had a pulse of 160. He concurred in the diagnosis of appendicitis with abscess formation. There was dulness over almost the entire abdomen, but little less towards the left. In making an incision over the region of the appendix, he found, instead of an appendiceal abscess, a strangulated or twisted ovarian cyst, with suppurative peritonitis.

TUBAL PREGNANCY.

DR. HARSHA reported a case of tubal pregnancy. The patient, Mrs. D., aged thirty years; married three years; one miscarriage, after which she had chronic endometritis. She missed one menstrual period in the middle of October, 1901. November 4, ten days before her next menstruation was due, she began to flow, and noticed in the discharge shreds of "light-colored fleshy substance." She had considerable pain, more or less periodical, which attended the flow, worse on the right side. She thought it a miscarriage. November 15, 1901, he first saw the patient in the evening. The flow had continued from November 4, more or less free, with shreds of decidua. Pain increased; tenderness on the right side of the uterus; tumor same place, easily felt per vaginam. No temperature. Diagnosis, tubal pregnancy. Operation at the Chicago Hospital, November 16. Usual abdominal incision, which proved to be fortunate, as there were adhesions which would have been difficult to deal with through the vagina. Prompt recovery. Patient left the hospital in two weeks.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. Spontaneous Gangrene. By DR. STANKO MATANOWITCH (Heidelberg). Spontaneous gangrene is intended to cover all forms of gangrene not produced by immediate external influences; consequently, this article merely reviews the familiar forms of gangrene. Ultimately the causal factor for every form of gangrene is interference with the circulation and overwhelmingly the arterial system as arraigned against the venous. Sclerotic changes of vessels are not alone peculiar to senile gangrene, but are also encountered in younger individuals with no other stigmata of senility. This form of gangrene has been styled presenile gangrene. Etiologically, angiosclerotic changes are called forth by toxic agents, syphilis, diabetes, mineral poisons, organic poisons, tobacco and alcohol, and exposure to cold. These factors, in turn, act noxiously on the tissues themselves. As bearing on presenile gangrene, Erb has called attention to an intermittent limp due to arteriosclerosis of the tibials, perceptible by their diminished pulsation. Aside of this distinctive diagnostic feature presenile gangrene merges into senile gangrene. While the majority, led by Manteuffel, advocate high amputation, a very few would make the operation selective, dependent on the persistence of the level of pulsation. In diabetic gangrene, arteriosclerosis was always encountered. Here, also, high amputation is indicated, but greater range of individualization is permissible. The non-appearance of progress of constitutional symptoms justifies awaiting the line of demarcation. The author advocates conservatism in all amputations where vascular changes warrant it. A study of the circulation and a proper healing of the wound can be best

furthered by controlling the hæmorrhage digitally instead of using an Esmarch constrictor. If, under these conditions, there be little hæmorrhage, a higher amputation should be immediately performed. As to embolic gangrene, its sudden onset is attended with immediate palsy of the limb, and discoloration spreading from above downward; intense pain, and, finally, association of valvular disease of the heart. It is the last factor that makes the prognosis in these cases worse than in the senile gangrene. If no infection invades the body from the gangrenous limb, the line of demarcation may be awaited, otherwise the level of pulsation determines the choice.

Raynaud's disease, *strictu sensu*, precludes any of the above enumerated factors, and the author rightly holds to Raynaud's original definition, inclusive of symmetrical appearance. Also excluded from the category of Raynaud's disease are cases of gangrene due to syringomyelia. Finally, a few cases of gangrene of limbs of infants are narrated following the exanthemata. Very rarely lues may be responsible for these.—*Beiträge zur klinischen Chirurgie*, Band xxix, Heft 3 (Schluss).

II. Pure Carbolic Acid in the Treatment of Septic and Suppurating Wounds. By DR. B. HANSEL (Tübingen). The author's experiments lend a scientific basis to the method of (Powel-Phelps) applying pure carbolic acid to wounds. Incidentally, he refers to Fraser (*Medical Record*, 1895, November 23) as the first one who accidentally hit upon alcohol as the antidote to pure carbolic acid.

In the treatment of wounds, it is a matter of clinical record that general intoxication is more wont to follow the use of dilute solutions of carbolic than the application of pure carbolic. Experimentally, a quantity of carbolic acid, pure and for control dilute, was injected into rabbits subcutaneously, intraperitoneally, and into the rectum. In every instance a larger quantity of pure carbolic was tolerated before toxic and lethal effects set in than

was the case with dilute solutions of carbolic acid. Locally, a prolonged application of dilute carbolic has often caused gangrene, and this happens in greater degree when pure carbolic is used, but the latter only after long contact. Alcohol is capable of abstracting more carbolic acid from the tissues than water; wherefore its caustic effect can be obviated by combining it with alcohol.

Germes suspended in solutions free from albumen are less readily killed by pure carbolic than by sublimate; but where albumen enters into the medium, it surpasses sublimate as a bactericidal agent. Experiments were now conducted on infected granulating surfaces of rabbits. From the surfaces treated with carbolic-alcohol washing exceptionally any growth of bacteria was obtained; but this was regularly the case when sublimate was employed.

Experimentally, the kidney of a rabbit was for one minute subjected to carbolic acid and alcohol treatment. Six hours later traces of carbolic could yet be detected. This speaks for the persistence of carbolic acid and alcohol. Add to this its non-paralyzing effect on tissues, and we have an ideal agent in this combination to effect disinfection of septic surfaces. The application of this method to cellulites and abscesses was always efficient. Very noticeable was the experience that the wound secretion was always scant, and it was possible to leave the first dressing on for eight days. At the expiration of this period, the wound tampons were easy of removal. The author finds it only of value in such tuberculous joints where pyogenic organisms enter as a factor in the infection. Where the infectious matter resides in a thick layer of granulation tissue, the latter has first to be removed. This mode of applying carbolic acid to septic wounds is a great accessory to the otherwise physical methods of treating wounds.—*Beiträge zur klinischen Chirurgie*, Band xxx, Heft 2.

MARTIN W. WARE (New York).

REVIEWS OF BOOKS.

ANATOMY IN ITS RELATION TO ART. By GEORGE McCLELLAN, M.D., Professor of Anatomy at the Pennsylvania Academy of the Fine Arts, etc. With 125 full-page illustrations. Imperial quarto, pp. vii, 142. Philadelphia: W. B. Saunders & Company.

It has always been a mooted question among artists and art critics whether or not a comprehensive study of anatomy should form an integral part of an artist's equipment. It is, of course, the problem of the master in art to represent the significant, and in the domain of figure art, whether sculpture or painting, the most significant thing is the human frame. In draped figures it is the nude underneath that is expressed by the arrangement of drapery and flow of line. The full sense of the significance is, however, not grasped until the movement of the figure, that is the artistic representation of the force that vitalizes it, is portrayed. The positions assumed by the different members of the body and the muscles and tendons that control them, if presented in their relation to any significant motion, will enable us to feel the reality of the subject. That we must then understand the anatomical relations existing between the different members of the significant form of figure art is certain; and art students are to be congratulated upon the appearance of Dr. McClellan's work upon *Anatomy in its Relation to Art*.

That the author understands with an artist's feelings the true relation which should exist between anatomy and the representation of the human figure is shown in the statement of the subject, "Anatomy for art purposes should never be obtrusive.

It should be employed as a means of analysis and interpretation of motion and form, and thus used will serve to encourage keener powers of observation, upon which excellence in representation so much depends."

Without sacrifice of detail or scope, the subject has been brought within easy comprehension of all, whether familiar or not with scientific nomenclature. Such technical phraseology as could not be avoided is translated. The illustrations are numerous and realize well the purpose of the text. The subjects of the pictures are drawn freely from the living model, as well as from casts, and in each case serve to make perfectly evident the writer's conclusions.

Starting with the idea of the human body being designed to be supported erect, Dr. McClellan canvasses the problem presented to the artist in the case of standing male and female figures. Complementary plates illustrate the relation of the skeleton and covering in both sexes in various positions.

The bones of the head and face, appropriately considered, lead to the exposition of the muscles of the head and face, and a series of diagrams makes clear the action and position of the facial muscles when the emotions, laughter, horror, astonishment, anger, disgust, and grief are expressed. It is to be regretted, in this connection, that some explanation is not forthcoming concerning the causes or sources of expression in the countenance, which cannot be explained by contraction of muscles controlled directly by the will. In looking at the diagram depicting horror, we can readily perceive why a man stands with his eyes fixed intently upon the object inspiring fear. The position of the muscles controlling the eye is due to the intent application of the mind upon the subject in the line of vision. The parted lips, rendered to show a quiver, the hollowness of the cheek, pallor, etc., are the result of other causes. The broader effects are obtained in the diagram; and if the method of realizing the more delicate shades could be traced to its anatomical sources, undoubtedly

benefit would result. Certainly, attitude and posture of the head help greatly in the representation of the varied emotions, yet this has been indicated only in the figure of grief.

The text and plates treating of the neck, trunk, thorax, abdomen, back, upper extremity, pelvis, and lower extremity are satisfactory and essentially practical.

Of exceptional value and interest is the presentation of the subjects treating the general consideration of the whole skeleton, the influence of the skeleton and muscles on surface form and general attitudes and postures. There has been no differentiation made between the representation of the comparative position of the muscles in the working out of a figure in motion and at rest. In the latter case the sculptural or pigment figure may be vitalized by the exact representation of the muscles as they exist in a human figure in the given position at rest. As soon, however, as the figure is in motion, the exact copying of the muscular structure and form must be modified. The physical structure of the retina is such that the registration of the impingement of the visual rays overlaps. The translation of these retinal operations is such, that, to enable us to appreciate motion, we must have the anatomical details of our figure so arranged that a single retinal impression will result, equal to the composite one that would be received in actual observation. When this physical sense has been satisfied, and to it has been added an appreciation of what the next position will evidently be, we then have a perfect portrayal of motion. The plates, showing a woman dancing, the Discobolus, a woman running, and the athletes wrestling, might have been contrasted to the representations of figures in repose, to bring out the anatomical arrangement and the variations required to successfully render these subjects.

The volume closes with a carefully developed exposition of the proportions of the human figure. The proper relative length of the several parts of the body can be determined by measurement, and the table of dimensions given is the result of very

Careful examination of many skeletons and numerous living models.

There is an evident harmony between the scientific and the artistic in the author that enables him to feel the gap between science and art, and in his attempt to bridge it, Dr. McClellan has given a scholarly and very suggestive exposition of the relation between anatomy and art.

LEWIS F. PILCHER.

A TEXT-BOOK ON DISEASES OF THE EAR, NOSE, AND THROAT.

By CHARLES H. BURNETT, M.D., E. FLETCHER INGALS, M.D., JAMES E. NEWCOMB, M.D. Philadelphia and London: J. B. Lippincott Company, 1901.

There is the need, which the editor speaks of in his preface, of a text-book to combine in one volume for students a handy compendium of diseases of the ear, nose, and throat, thorough enough to meet the demands of the medical curriculum of to-day on these closely allied specialties. The book before us seems to meet this need well, though it has a wholly inadequate index. For example, the word "adenoids" is not found in the index, though a chapter of excellent matter is devoted to the subject under the title of "Hypertrophy of the Pharyngeal Tonsil," and the term "adenoids" is repeatedly used in the text.

Text, leading, make-up, and form are all good. It is an important new feature that this text-book in two of its divisions—ear and throat—refers to the interesting embryology of the parts concerned, the more necessary now, since so many students anticipate their medical studies by selective preparation in biology in their academic work.

The first division, on the Ear, by Dr. Charles H. Burnett, bears the stamp of the author's care and ability. Unconsciously perhaps to himself, he has given his best treatment to that part which deals with the anatomy and physiology of the internal ear and the various phases of affections which have to do with

changes in pressure in the endolymph. One may not agree with the author's purely mechanical theory of ear-vertigo, and yet concede the correctness of most of his facts and observations. It is strange, however, that he passes by in silence that series of observations made by others on symptoms of Ménière's disease which disappear on removing nasal and other faults, in which a sclerosed and retracted membrum tympani is not found.

Notwithstanding the general completeness of this part, we think it lacks in special helps to operative technic in acute and chronic mastoid and sinus cases, where the greatest and most important recent progress has been made. On the whole, it is the work of a master.

The second part, on the Nose, is treated by Dr. E. Fletcher Ingals comprehensively and compactly in 242 pages. It is also the product of an experienced and competent teacher. The three pages on physiology contain the interesting statement that "irritation of the surface of the nasal cavity may cause inspiratory arrest of respiratory movements," given for its value in relation to chloroform anæsthesia, with three hypothetical motives for the concurrent reflexes of sneezing, spasm of the glottis, and contraction of the bronchial tubes. But the valuable therapeutic fact applicable to such a physiological fact is not mentioned, though it must be known to the author that cocaine, by local anæsthesia, safeguards the danger from irritation and, by its physiological action as a stimulant, intensifies that safeguard when used in very small quantity. It is further curious to note how the reflexes here, so readily admitted, are, in a few sentences later and everywhere else in the text, so studiously explained away or minimized. Throughout the author's treatment of the nervous phenomena, he fails to see the perfect naturalness of the concurrence of certain so-called reflexes on the ground of their common factor in the sympathetic system of nerves, whether in pure ganglia as in the intestines and uterus, or in mixed nerves such as the fifth and vagus. Hence his equivocal acceptance of the reflex, page

261 (asthma in hay-fever), p. 288 (effect on smell of Gasserian ganglion), p. 305 ("distant reflexes are to be viewed with scepticism").

The author knows well how to do things and to describe with helpful detail in an easy style, and he knows and describes all the newer methods as far as would be judicious in such a text-book.

Dr. James E. Newcomb writes the third division, and treats fully enough and well all that properly belongs to the Pharynx and Larynx in such a text-book. Tonsillotomy is properly safeguarded by well-timed warning as to the possibility of dangerous hæmorrhage, and how to be prepared for it. The chapters on syphilitic, tubercular, and malignant affections of the larynx are perhaps his best, giving neither too much nor too little, and very properly avoiding diffuse consideration of unusual tumors and abnormalities, thus bringing into larger relief the commoner ones. The laryngeal neuroses are simply and sufficiently treated for a text-book which does not assume to be a treatise. Diphtheria receives adequate consideration, though lacking the excellent fullness given to it by Shurley. Intubation and the use of antitoxin are duly treated, without uninteresting detail and without discussion of the theories involved in the latter. Our judgment commends this text-book.

HEBER N. HOOPLE.

NOTICE.

THE NATHAN LEWIS HATFIELD PRIZE FOR ORIGINAL RESEARCH IN MEDICINE.

THE College of Physicians of Philadelphia announces through its Committee that the sum of five hundred dollars will be awarded to the author of the best essay in competition for the above prize.

Subject: "The Relation between Chronic Suppurative Processes and Forms of Anæmia."

Essays must be submitted on or before March 1, 1903.

Each essay must be typewritten, designated by a motto or device, and accompanied by a sealed envelope bearing the same motto or device and containing the name and address of the author. No envelope will be opened except that which accompanies the successful essay.

The Committee will return the unsuccessful essays if reclaimed by their respective writers or their agents within one year.

The Committee reserve the right not to make an award if no essay submitted is considered worthy of the prize.

The treatment of the subject must, in accordance with the conditions of the Trust, embody original observations or researches or original deductions.

The competition shall be open to members of the medical profession and men of science in the United States.

The original of the successful essay shall become the property of the College of Physicians.

The Trustees shall have full control of the publication of the memorial essay. It shall be published in the Transactions of the College, and also when expedient as a separate issue.

Address J. C. WILSON, M.D., *Chairman*.

College of Physicians,
219 South Thirteenth Street, Philadelphia, Pa.

AN EXPERIMENTAL AND CLINICAL RESEARCH ON THE TEMPORARY CLOSURE OF THE CAROTID ARTERIES.

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INTRODUCTION.

THE greatest danger attending the larger operations upon the head and the neck, and that which, more than any other, has limited the range of safe operative procedures, has been hæmorrhage.

In certain operations the later danger of pneumonia from blood inspired into the pulmonary tract is almost equal to the immediate blood loss. Keeping the field clear and securing the vessels occupy a large part of the time in operations. Precise dissections are possible only in a bloodless field. The practice of permanently closing the carotid arteries may be justifiable in the case of the external carotids, since both the immediate and the later effects are not specially prejudicial, but what of the common and the internal carotids?

In Wyeth's tables the mortality rate from cerebral complications alone amounts to 11 per cent. Of 789 cases, forty-nine developed hemiplegia, one imbecility, and in eighteen others delirium, convulsions, and other cerebral disorders followed. Of those that lived either a short time or recovered more than 7 per cent. developed paralysis. Permanent closure has in the main been practised for the want of a safe method of temporary closure, but it carries with it grave responsibilities.

SUMMARY OF EXPERIMENTAL EVIDENCE.

For the purpose of this research, nineteen dogs were subjected to experiment. The details of these experiments will

be elsewhere reported. The results may be summarized, however, as follows:

Histologic.—The gross specimens presented an oval outline on section at the constricted portion. This flattening of the artery was more marked in those carotids which had been clamped for some hours and in those in which the clamps had been tightly adjusted. The histologic appearance of arteries clamped for short periods and examined at once showed but slight change. Arteries clamped for periods of from fifteen minutes to half an hour showed little effect other than a slight tearing of endothelium at the extremities of the oval; those clamped for an hour showed a greater amount of distortion of the endothelium at the margins of the oval with some separation, also endothelial cells, which were massed between folds of fenestrated membrane. The elastic layers were slightly distorted at the constricted portion. The elements of the middle layer were massed at the extremities and somewhat disarranged. The adventitia was unchanged. The histologic appearance of the carotids from the recovery experiments varied with several conditions. The amount of pressure exerted by the clamp, the presence or absence of wound infection, and the length of time the clamps were allowed to remain on the artery modified the results.

Some specimens clamped too tightly for four or six hours showed marked degeneration of the middle coats with œdema and a thickening and disarrangement of the intima, with loss of endothelium and a very perceptible narrowing of the lumen; others were thrombosed, some were necrotic. In those carotids in which care was taken to adjust the clamps so as to exert only sufficient pressure on the artery to close its lumen, the histologic changes were unimportant. A clamp adjusted too tightly caused pressure necrosis in a few hours, while other carotids were clamped from twenty-four to forty-eight hours without notable damage to the arterial walls. The intima and elastic membrane were but slightly affected, though the media showed some evidence of degeneration. The adventitia was but slightly altered.

The presence or absence of infection of the wound was of

great importance. In those cases in which an infection appeared the arteries showed the greatest changes. In many instances the artery was necrotic at the clamped portion, and in some instances it was severed. The media and adventitia both above and below the constricted portion showed round-celled infiltration, and in some areas necrosis. The intima and the inner elastic membrane were disorganized and distorted. In those thrombosed, the lumen was narrowed, owing to œdema and thickening of the walls.

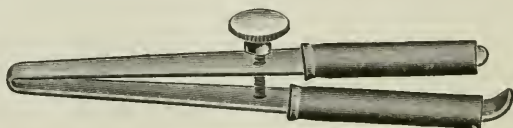
The experiments showed that a properly adjusted clamp could be left in position, closing the artery from twenty-four to forty-eight hours, without serious injury to the walls.

Physiologic.—The immediate effect on the circulation of temporarily closing one carotid artery was to increase the blood-pressure, but usually a compensation followed, and the pressure returned to its normal level. No effect upon the respiration was observed. Simultaneously closing both carotid arteries produced a greater rise in the blood-pressure, which by physiologic compensation usually soon returned to the normal level. In many of the experiments there was a decrease in the respiratory action, although the effect was very slight. In no instance were there any striking results noted. In the recovery experiments in the cases in which the clamps were allowed to remain on the arteries, closing them and the wound pursuing an aseptic course, no effect upon the animal was observed beyond that attributable to the anæsthesia and the operation. The animals seemed playful and strong. Even after twenty-four hours of complete closure there was not much macroscopic evidence of injury to the vessel wall. The circulation through the clamped portion was readily re-established. However, in cases in which, during the application of clamps for a considerable length of time, say two days, the animal in the meantime had suffered infective inflammation of the wound, the damage of the vessel walls was very considerable, and the lumen was in some instances occluded. As to the after effects, in no case was there clotting; the aseptic cases made good recoveries, the circulation was re-established, and no impairment of consequence was observed. The circulation of the

brain was carefully observed at the post-mortem, and in no case were either emboli or thrombi found, or any effects on the brain noted. After considering several devices, the most accurate, efficient, and safe one seemed to be that of applying a clamp, so constructed that its blades could be adjusted by means of a set screw. When the blades were approximated so as to close the vessel, but not compress its walls, they were parallel to each other. One blade was made longer than the other, and its end turned up so as to prevent the escape of the artery. Over these blades were stretched pieces of rubber tubing, thereby minimizing the effect of contact with the vessel wall. In applying the same, it is necessary to bear in mind that the walls need only be approximated, not compressed. The adjustable screw gives so perfect a mechanical control of the lumen of the vessel as to enable the surgeon to perform the operation and secure the bleeding vessels with a minimum loss of blood.

CLINICAL APPLICATION.

Technique.—Twenty minutes previous to making the incision one one-hundredth of a grain of atropine should be injected, in cases in which the technique is likely to involve the trunks of the vagi or their superior laryngeal branches, for the purpose of preventing possible inhibitory action upon the heart. Each common carotid artery is closed by means of a small clamp, whose blade is long and protected by a thin rubber tubing. The lower blade is slightly longer than the upper.



and turns up at its free end so that its grasp upon the artery will be more secure. The spring end of the clamp is so arranged that when the blades are closed sufficiently to approximate the walls of the vessels they become parallel. The closing of the blades is accomplished by an adjustable thumb-screw, making definite closure. In operations in which blood may enter the pulmonary tract, the patient should be placed in a Trendelenburg posture. This partially compensates the

lowered cerebral blood-pressure resulting from closing the carotids. While this posture somewhat increases the venous and capillary hæmorrhage, the increase of the venous pressure diminishes the danger of the entrance of air into the larger venous trunks, should they accidentally be injured. Fortunately, venous and capillary hæmorrhages, except in cases involving the larger veins, are relatively of little consequence. On completion of the operation, in cases in which the Trendelenburg posture is employed, it is safer to restore the patient to the horizontal position before releasing the carotids, as in the inclined posture the normal blood-pressure of the brain is increased by the mechanical factor, and releasing the clamps in this position would raise the pressure above the normal. The release of the clamp should be made slowly while inspecting the field of operation to detect any vessels that might have been overlooked. The control of the arterial hæmorrhage is absolute, except in such vessels as receive direct collateral pressure from the vertebral arteries. According to the researches of Bayliss and Starling, there are no vasomotor nerves supplied to the vessels of the brain. The circulation being largely mechanical, the blood-vessels of the brain should be more favorable to the employment of such technique than the vessels of almost any other organ of the body in which the blood supply is more or less regulated by the vasomotor mechanism.

REPORT OF CASES.

CASE I.—*Removal of Large Fibrosarcoma of Roof of Mouth during Temporary Closure of both Common Carotids. Recovery.*

Operation was performed January, 1897. The patient upon whom this technique was employed was a colored man, forty-six years of age, admitted to St. Alexis Hospital on account of a large fibrosarcoma filling the mouth so as to render its complete closure impossible. Breathing was so obstructed as to threaten suffocation, and at night was so heavy and labored that it could be heard at a considerable distance. Under cocaine, tracheotomy was performed for the double purpose of removing the danger of asphyxia and as a part of the technique to be employed. Aside from emaciation from the necessary liquid diet, the patient was in good condition. The tumor was first observed six years previous in the

posterior part of the hard palate. A year later it was removed, but recurred, and had been growing since that time. On account of its size, the extent of its attachments when I first saw him could not be determined. Its translucent surface displayed a rich supply of blood-vessels, some of considerable size. In the operation the technique here described was employed. The tumor was delimited by an incision in the healthy mucous membrane. The hard palate was divided along this line. The vomer was severed along the floor of the nose and the entire mass turned out. After the necessary revision of the wound the principal vessels were secured, and everywhere the wound was touched with the thermocautery. After the operation had been completed, the wound dressed, and perhaps ten minutes had elapsed, respirations suddenly failed. Artificial respiration was maintained during twenty-five minutes. The application of ice, alternated with a brisk rubbing with a warm towel, proved an efficient stimulus to respiration. The entire mouth was packed with iodoform gauze, which was allowed to remain for twenty-four hours, after which boric acid solution with sufficient thymol to correct the disagreeable odor was used in a mouth wash. The tracheal tube was removed after two weeks, when it was thought that the danger of pulmonary infection had passed. The patient was soon able to leave his bed, and made an uneventful recovery. Four and a half years later there was no recurrence.

CASE II.—Removal of a Large Congenital Tumor of the Neck. Temporary Closure of both Common Carotid Arteries. Recovery.

Female, twenty-one years of age. At birth the tumor was large and more developed on the right side than on the left, greatly increasing in size as she grew older. At the time of operation the tumor occupied the entire anterior and much of the latter portion of the neck. On the left side it extended past the line of the ear, on the right over the border of the sternomastoid muscle. It extended from the sternum to the chin. The whole tumor was very large and pendulous. There was free discharge of a glairy mucus from several sinuses. In these a probe could be passed down to the level of the larynx. The tumor mass was of varied consistency, at places cystic and moderately fluctuating, at others giving the resistance of fleshy tissue. The sinuses did not communicate with the interior of the larynx. A laryngoscopic examination showed that the trachea was markedly flattened in its

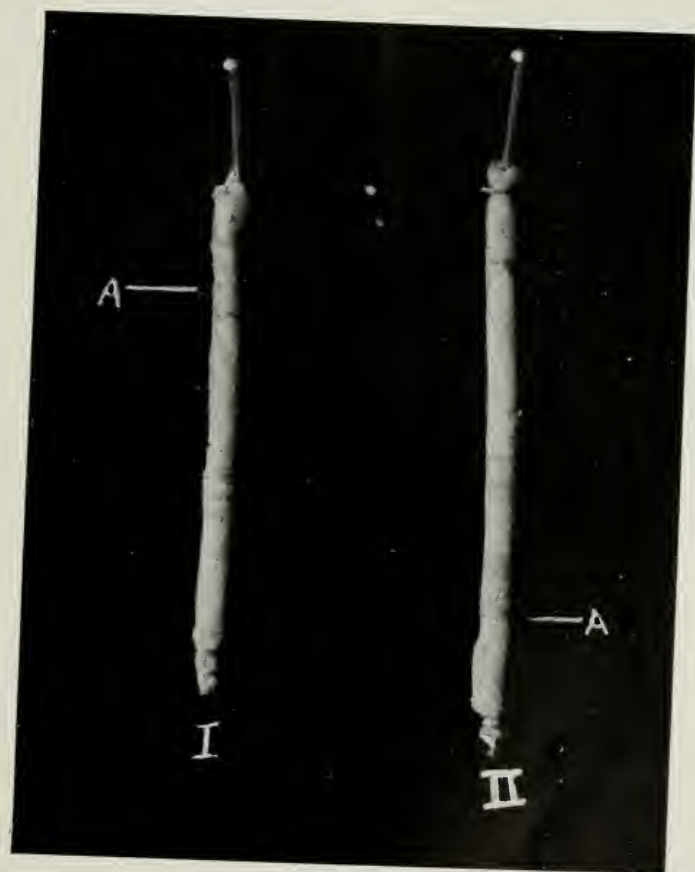


FIG. 1.—A, A, showing the point at which the vessels had been closed for forty-eight hours, in which, after removal of the clamps, the lumina were restored.

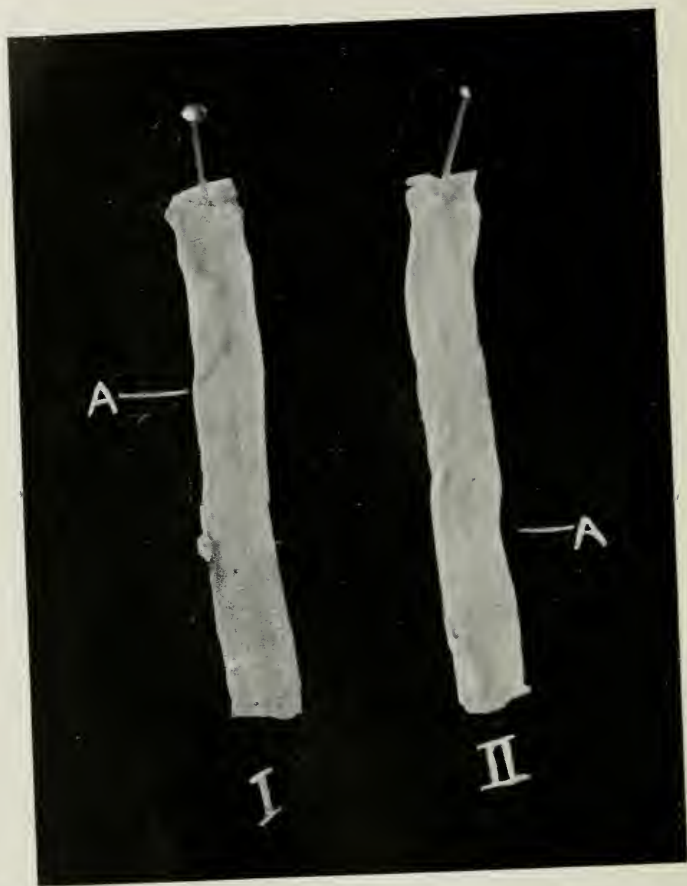


FIG. 2.—Showing the specimens in Fig. 1 opened. Note the smooth contour of the exposed inner coats of the vessels.

anteroposterior diameter. Both voice and respiration were impaired. The danger of hæmorrhage was so great that the patient had previously been advised against operation.

Operation.—The carotid arteries were found pressed back against the vertebral column. They were closed by means of the clamps, after which the operation was performed almost bloodlessly. The only blood loss was in making the incisions in the portion supplied by the inferior thyroid arteries, which were not closed. When the common carotid arteries were clamped the face became blanched, and the pulse disappeared from all portions of the head. In experiments on animals we have been able to show that the intracranial pressure is kept sufficiently high for the functioning of the bulbar centres by the vertebral arteries alone. If, however, the closure of the common carotids is permanent, cerebral softening is likely to ensue; if temporary, no untoward effects follow. The patient made a good recovery, and there is but a minimum scar on the neck. Both of the external jugular veins were excised with the tumor. All of the deeper structures were laid bare. The tumor was in anatomical relation with the sheaths of the common carotid arteries, the trachea, the larynx, and all the deeper structures of the neck. There was no capsule. At first I was inclined to believe that one of the recurrent laryngeal nerves was sacrificed. She spoke in stridulous tones. Later the voice cleared.

CASE III.—*Clamping of both Common Carotids; Partial Resection of the Tongue; Removal of the Floor of the Mouth; Excision of the Submaxillary and Sublingual Glands; Resection of the Parotid; Excision of the Superficial and Deep Cervical Lymphatic Nodes on the Left Side; Excision of the Jugular Vein; Resection of the Buccal Aspect of the Inferior Maxillary Bone. Recovery.*

Diagnosis.—Typical epithelioma situated on the floor of the mouth, extending from the left side of the tongue to the inferior maxilla. Slight enlargement of several lymphatic glands could be palpated. Age, forty-eight; previous health, good; obese and plethoric; weight two hundred and thirty-six pounds; neck short, thick, and fat.

Operation.—Chloroform-morphine anæsthesia. One one-hundredth grain of atropine was given half an hour before the operation to prevent cardiac inhibition from probable mechanical irritation of the superior laryngeal or of the vagus. Both common

carotids were closed by means of the rubber-tipped screw-clamps. The incision on the right side being an inch long, fibres of the sternomastoid were separated. On the left side the vessel was secured in a like manner. The incision was carried upward, then outward, parallel with the jaw to the parotid gland, and an inner incision was carried to the median line. Reflecting the skin exposed the entire cervical field. The superficial chain of glands was first removed, then the deeper. The submaxillary gland was encroached upon by a metastasis of the adjacent lymphatics, and was accordingly removed. Metastases were found in the deep cervical, in the parotid region, and along the jugular vein. The jugular together with the glands was excised. While dissecting out the deeper glands the pulse increased rapidly to 162, due to increased stimulation of the sympathetic, while the vagal action was prevented by the atropine. The cause being recognized, no stimulation was given. The pulse soon returned to the previous rate. The extensive cervical dissection was then packed with gauze. The tongue was held well over and the mouth lightly packed with gauze. The base of the tongue, the entire floor of the mouth on the left side, and about half of the adjacent jaw were removed. The resection of the tongue included about one-third of its left half and base. There was free communication between the mouth and neck.

The clamps were now gradually unscrewed and the circulation of the mouth, face, and neck re-established. The absolute control by means of the screw-clamps made it possible to secure all the bleeding points without appreciable blood loss. There was but a trifling hæmorrhage, mostly venous, and the operation was greatly facilitated by keeping a bloodless field. The patient made a rapid recovery. There were no unfavorable symptoms due to the closure of the carotids either during the operation or after it.

CASE IV.—*Temporary Closure of Common Carotid; Removal of Sarcoma of the Parotid; Vagus exposed; External Carotid and Jugular tied; Cardiac Inhibition from Vagal and Laryngeal Irritation; Application of Two Per Cent. Solution of Cocaine prevented Further Inhibition. Recovery.*

The common carotid was closed by means of the special clamp; the jugular vein and the external carotid were excised; the vagus was laid bare. On account of an insufficient dose of atropine, irritation of the vagus while separating it reduced the heart



FIG. 3.—Microphotograph of a cross section at the point of closing the carotid artery in an experiment in which the vessel had been closed twenty-four hours.

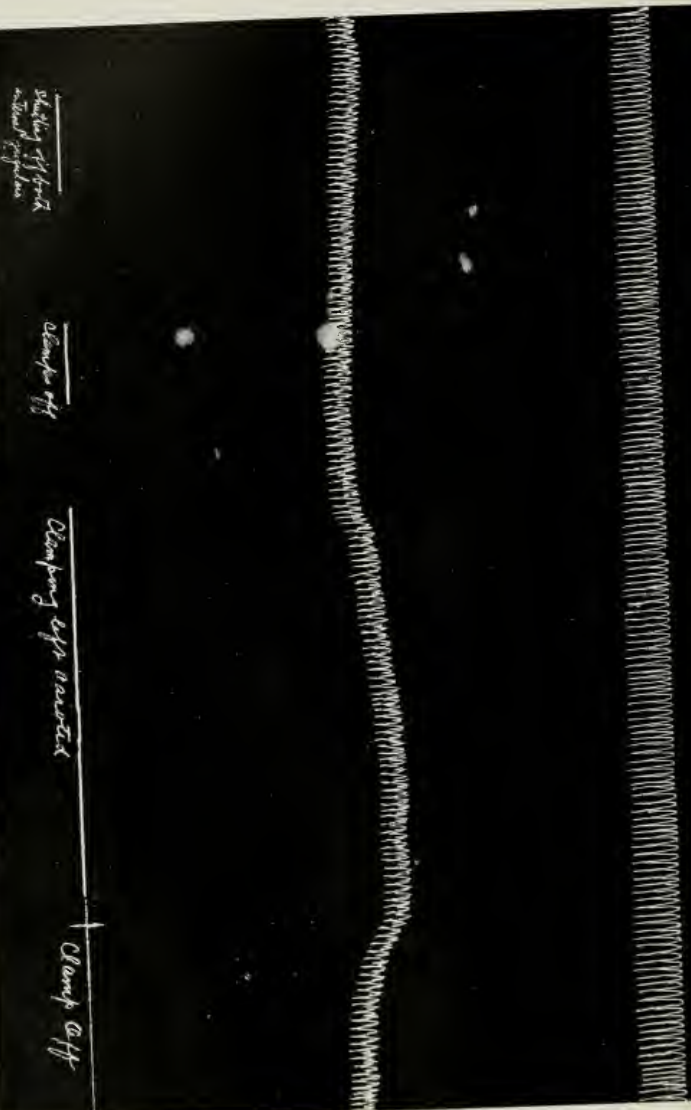


FIG. 4.—*a*, Respiration; *b* blood-pressure; *c*, signal; *d*, seconds. 1, Clamping both jugulars; 2, unclamping.—no effect upon the blood-pressure; 3, clamping the left carotid.—note a rise in blood-

beats from 92 to 56. The nerve being exposed; cotton saturated with a 2 per cent. solution of cocaine was packed around it. Although it became necessary to inflict greater mechanical irritation in the further dissection than had been previously inflicted, the heart promptly returned to 90, and was not further affected. Cocaine blocked the afferent impulses and protected the heart. Quick recovery followed.

CASE V.—*Excision of the Tongue, Left Floor of the Mouth, Middle Half of the Jaw, Glands of the Neck, Submaxillary, and a Portion of the Parotid Glands en bloc for Carcinoma. Recovery.*

Male, aged fifty-eight years, preliminary tracheotomy one week before the operation. Both common carotids closed by means of the clamp. One one-hundredth grain of atropine given. Incision carried along the large vessels in the neck, exposing them, to the angle of the jaw, then upward to the base of the jaw; another incision parallel to the jaw. Skin flaps laid back in all directions. Large vessels exposed at the base of the neck. All the glands and fascia removed up to the jaw. Jaw sawed through at two points, after which the entire tongue, floor of the mouth, and left tonsil were removed with the scissors. The pharynx had been previously packed with gauze. There was but a trifling hæmorrhage. The patient's pulse-rate never changed during the operation, which was completed in thirty minutes. The closing of the common carotid arteries afforded a bloodless field so far as capillary and arterial hæmorrhage was concerned, and but slight from the venous sources. The atropine paralyzing the terminals of the vagus prevented any inhibition. Patient made a rapid recovery.

CASE VI.—*Carcinoma arising from the Duct of the Parotid Gland. Excision during Closure of the Common Carotid. Recovery.*

Female, aged forty-two years, in good physical condition. During the operation the large vessels and the upper portion of the vagus and the superior laryngeal were exposed. Although the patient had been given one one-hundred-and-twenty-fifth grain of atropine, the pulse was reduced during the manipulation of these structures from 90 to 52. A piece of cotton saturated with 2 per cent. solution of cocaine was packed down upon the nerve, after which the pulse returned to its previous rate in less than a minute. The operation was completed, involving even

greater manipulation of the vagus and the superior laryngeal, with no effect upon the heart's action. The respirations were shortened and deepened.

CASE VII.—*Closure of the Common Carotids. Physiologic Dosage of Atropine; Laryngeal Application of Cocaine; Excision of the Tongue, Epiglottis, Left Tonsil, Floor of the Mouth, Lower Jaw, Submaxillary and Parotid Glands, Left Jugular Vein, Left External Carotid Artery and the Vagus Nerve; but little Shock. Easy immediate Operation. Recovery. Death from Secondary Hemorrhage on the Thirteenth Day.*

Patient had had six operations for epithelioma; the disease originated in the floor of the mouth. The operations and the disease had so far destroyed the jaw and the soft parts that the patient was with increasing difficulty able to eat. The cicatricial and carcinomatous contractions and hardening fixed the lower jaw and was progressively closing the mouth. The procedure was recommended after consultations with distinguished surgeons. The preliminary preparations having been made, an incision was carried from each angle of the mouth outward and downward in relation to the growth. The jaw was disarticulated on the left side, while on the right it was severed in the upper portion of the ramus. The extent of the external part of the operation was indicated by a free skin incision. The jaw was severed first on the right side, then on the left. The tongue, tonsil, and the floor of the mouth were then severed laterally and posteriorly, after which, by continuing the dissection along the vertical plane of the cesophagus, larynx, and trachea, all the structures, including the parotid, submaxillary and sublingual, and regional lymphatic glands were removed. The dissection then passed through the plane of the carotid artery, jugular vein, and vagus on the left side, all of which were included in the parts removed. Especial care was taken in securing the veins. The epiglottis, showing a tendency to close the larynx in a light, valve-like manner, was excised. The removal *en bloc* by carrying the dissection along the planes indicated not only facilitated dissection, but insured the removal of all the local carcinomatous tissue.

The patient bore the operation well, exhibiting a pulse-rate of 96 at the close of the operation and good respiratory rhythm. On opening the arteries, the circulation of the head was quickly restored and consciousness almost immediately regained. The

patient progressed favorably until the thirteenth day, when death from secondary hæmorrhage occurred.

The absolute control of the blood supply by means of the special device, thereby maintaining a clear field for dissection; the prevention of cardiac collapse through either direct or reflex inhibition by the administration of a physiologic dose of atropine; the prevention of reflex inhibition of respiration by the application of cocaine upon the laryngeal mucosa, place even so extensive an operation on a safe basis so far as the immediate operative effects are concerned.

CASE VIII.—*Angiosarcoma of Rapid Growth and Great Vascularity of the Cheek and Neck in an Infant Seven Months Old; Common Carotids closed by means of Special Mechanism. Removal of the Entire Growth. Recovery.*

The extensive development of the tumor and frailty of so young a subject almost precluded any operative procedure, but, on account of the assurance of a safe and absolute control of the blood supply, an excision was attempted. Both the common carotids were closed. The blood supply was absolutely controlled, and the dissection could be made in a clear field. The tumor had invaded the structures of the cheek, extending down to the mucous membrane, and in the neck extending well down below the angle of the jaw, involving the parotid region. After removing the entire growth it was impossible to bring the parts closely together. Repair was rapid, and the child made an uneventful recovery, the operation having been well borne.

CASE IX.—*Carcinoma of the Septum of the Nose. Excision. Closing both Common Carotid Arteries.*

Operation was performed bloodlessly, involving the temporary lateral resection of the entire nose, extending to the posterior nares, the base of the skull. Hæmorrhage entirely controlled. Nose was replaced. Good recovery.

CASE X.—*Excision of One-half the Tongue, the Floor of the Mouth, Submaxillary Glands, Entire Chain of Lymphatic Glands, extending along the Jugular and Angle of the Jaw. Excision of the Jugular Vein. Recovery.*

Preliminary tracheotomy. Both carotid arteries closed; fairly bloodless field, excepting a small amount of venous hæmorrhage. There was not even an appreciable alteration in the pulse and respiration. Patient made a good recovery.

CASE XI.—*Removal of Carcinoma involving the Floor of the*

Mouth and the Anterior Part of the Tonsil during Temporary Closure of the External Carotid.

The patient was sixty-eight years of age; weight 225 pounds; was in bad physical condition. The dissection included one-half the tongue and the left side of the mouth, the longitudinal section of the inner aspect of the jaw and the tonsil. The operation was performed almost bloodlessly. The pulse did not beat above 100 during the operation. Recovery.

CASE XII.—*Excision of the Upper Jaw for Sarcoma of the Antrum under Closure of One Common Carotid. Bloodless Operation. Recovery.*

The patient was sixty-two years of age, in fair physical condition, but had been an alcoholic. The only hæmorrhage noted during the operation was a sluggish flow from the larger veins; this continued only until the veins had emptied themselves. The highest pulse-rate during the operation was 92. Patient rallied quickly after the operation, but little anæsthetic was given after the arteries were closed. At the close of the operation respirations were slowed and some irregularity of the rhythm. The arteries were slowly released, restoring the circulation. Respiration then improved. Recovery.

CASE XIII.—*Cavernous Angioma of the Orbit in a Child Seven Years of Age. Closure of the Common Carotids.*

Patient had been operated upon several times by electrolysis, —once when he was three years old, and again at five; but the growth gradually increased until it involved a greater portion of the inner and upper parts of the orbit. The case was regarded as being inoperable on account of the danger from hæmorrhage, in fact, an attempt at operation had been made and abandoned. By closing the carotids, the excision was made almost bloodlessly. On account of the clearer view of the tissue, an excellent differential dissection could be made. The patient was not in danger at the operation, and on releasing the clamps no hæmorrhage occurred. A good recovery followed.

CASE XIV.—*Excision. Epithelioma involving the Tongue, the Floor of the Mouth, and the Side of the Mouth, Anterior of the Tonsil under Closure of the External Carotid Artery.*

Excision was made along the line of the sterno-cleido-mastoid muscle and the glands along the jugular vein were removed. The external carotid artery was closed. The dissection was made bloodlessly. Patient made a good recovery.

CASE XV.—*Closure of the External Carotid Artery. Excision of the Carcinomatous Gland below the Angle of the Jaw. Removal of One-third of the Lower Jaw. Removal of the Primary Carcinoma situated in Front of the Tonsil extending downward to the Floor of the Mouth.*

Male; aged sixty-nine years; alcoholic. There was but little loss of blood. The operation was performed in forty minutes. The patient made a recovery from the primary effects of the operation, but died of pneumonia on the seventh day.

CASE XVI.—*Excision of the Upper Jaw for Sarcoma. Closure of Corresponding Common Carotid Artery.*

The patient was fifty-two years of age. The operation was attended with no arterial and but little venous hæmorrhage. Patient made a good recovery.

CASE XVII.—*Excision of the Right Superior Maxilla and the Intermaxillary Bone. Closure of the Right Common Carotid Artery.*

Female, aged twenty-one years, had had a tumor of the upper jaw for four years; there had been but little pain. The tumor occupying the inner half of the superior maxilla and the intermaxillary protruded above the line of the bases of the teeth, from the left incisor to the right bicuspid. The nasal half of the cheek was prominent. A quarter-grain of morphia and one one-hundredth grain of atropine were administered twenty minutes previous to the operation. Chloroform anæsthetic. The bony field was exposed by dissection within the mouth. The bones were severed and removed without cutting the skin of the face and with but slight loss of blood. The pulse at no time was above 88; duration of operation, thirty minutes. A good recovery followed.

CASE XVIII.—Male, aged sixty-four years. Alcoholic. Both common carotids clamped. The left common carotid, jugular vein, and all the overlying soft parts; the submaxillary and parotid glands; one-half of the lower jaw; the corresponding portion of the floor of the mouth were excised. The pulse and respiration remained good until the cerebral symptoms were marked. During the operation the respiration became dangerously slowed at one time. The operation was well borne, and recovery from the immediate effects followed. He began on the sixth day to show beginning cerebral softening, and died exhibiting typical symptoms of the same on the tenth day. In this case,

considering the age and previous habits, it would have been better to have taken some risk in leaving infected tissue rather than to have excised the common carotid artery. At any rate, the internal carotid ought to have been spared.

CLINICAL SUMMARY.

One or more carotid arteries were closed in eighteen patients. Both common carotids were closed in ten; one common carotid in five; one external carotid in three. In all there were twenty-eight closures of individual vessels. These were performed between the years 1897 to 1901.

The ages of the patients ranged from seven months to sixty-nine years. There were no deaths attributable to the temporary closure of the arteries.

In every instance the circulation was resumed immediately upon releasing the clamps. There were no appreciably late effects upon the vessel wall at the point of clamping and none upon the circulation in the closed arteries and their branches.

There were no later cerebral effects. Less anæsthetic was necessary with closed arteries, especially in the cases in which common carotids were closed. In the latter case there may be embarrassed respiration, especially later. Wholly or partially releasing one or both carotids gave material and immediate assistance to the respiration.

The operating time was much diminished, since the field of operation was quite free from blood.

The amount of blood loss was strikingly less, as was also the difficulty in keeping blood from the respiratory tract.

The application of the clamp may be accomplished through a very small incision and in several minutes. The proper interpretation of a slowed or of an accelerated pulse, or of an inhibited respiration, the prevention of either direct or reflex inhibition of the heart from mechanical stimulation of the vagus or its branches by the use of atropine and cocaine, the safe and absolute control of hæmorrhage by temporarily closing the carotid arteries render operative procedures of the head and neck so much safer as to greatly increase surgical possibilities.

STEREOSCOPIC RADIOGRAPHY.¹

By ALEXANDER B. JOHNSON, M.D.,

OF NEW YORK.

ALTHOUGH an article with this title was published in the *British Medical Journal*, by Mr. Mackenzie Davidson, as long ago as December, 1898, the method of taking and viewing X-ray pictures in this way has, as far as I am aware, attracted little attention in the United States. In Canada, Professor Girdwood, of the McGill University, has made use of the method with satisfaction. In Germany, numerous publications have appeared describing the method and its advantages, and in October, 1901, a very beautiful apparatus was exhibited by Dr. Wiegel, of Rochester, New York, at a meeting of the New York State Medical Society held in the Academy of Medicine of this city.

In a former paper published by me in the *New York Medical Record* of September 7, 1901, my own experience in the technique of radiography was described, and something was said of the technique of stereoscopic radiography and its advantages. I now propose to deal with this latter topic in more detail, to describe the apparatus convenient for the purpose, and to correct certain errors discovered by more extended experience.

The advantages of looking at pictures stereoscopically are several. A single X-ray plate shows the shadow of the object pictured projected on one plane, and thus the true relations of points situated in other planes are lost. In order, then, to determine the position of a foreign body, a bullet, for example, embedded in a limb, several methods are open to us.

¹ Read before the New York Surgical Society, October 23, 1901.

We may take two pictures through planes at right angles to one another, and by a series of measurements from fixed points on the surface of the limb we may determine the actual position of the bullet; or we may take two pictures of the object through planes separated from one another by angles less than a right angle, and by observing the differences in size or situation, or both, of the projected shadows of the bullet on the plate, we may by a mathematical calculation, more or less simple, determine the position of the bullet in the body.

The very ingenious localizer of Mr. Mackenzie Davidson is based upon this principle. If, however, we take two pictures of the bullet upon two separate plates from two points of view separated by a distance equal to the distance between the visual axes of the two eyes, the points of view being in a plane parallel with the surface upon which the shadows are projected, *i.e.*, the plane of the photographic plate, the distance being in this case about two and a half inches, and then view the two radiographs in a stereoscope, the two images will combine to form a single picture, and the image of the bullet will be seen in its relations to the bones, the surrounding soft parts, and the skin with sufficient clearness to cut down upon it without further calculation other than such as may be furnished by our anatomical knowledge. This quality of stereoscopic radiographs which permits us to see structures at different depths in perspective is of great value, also, in the diagnosis of the deformities following fractures and dislocations, and in the recognition of the gross pathological changes taking place in diseases and tumors of bones.

Whoever has attempted to recognize the exact amount and character of the displacement in a recent case of fracture from a single X-ray picture, or even from two pictures taken from different points of view and looked at separately, must frequently have suffered vexatious disappointment.

On the other hand, stereoscopic pictures of fractures show the relative positions of the displaced fragments in a very satisfactory manner. The exact relations of the bones of a dislocated joint are seen with great clearness. The limits, and

often the character, of tumors growing from or attached to the bones may usually be clearly appreciated. The situation of sequestra and of tubercular foci in bone can sometimes be seen in a satisfactory way.

It might be supposed that, in order to get the stereoscopic effect by the union of two X-ray pictures, negatives of a very fine quality would be necessary. The contrary is the fact, as I shall endeavor to demonstrate in the case of a bullet embedded in the thigh of a man.

The plates are thin, the shadows are faint and taken separately, the pictures are almost worthless, but, when viewed together in the stereoscope, the position of the bullet in relation to the femur and to the skin is sufficiently clear to enable one to cut down upon it without hesitation. The practical details of the method are as follows: The mechanical devices necessary for the production of stereoscopic X-ray negatives are two:

First. A device which permits the X-ray tube to be moved a measured distance in a horizontal or vertical plane, so that the two pictures may be taken from separate points of view in the same plane, distant from one another two and a half inches, equivalent nearly to the distance between the pupils of the two eyes. In other words, the principle is the same as is used in taking ordinary stereoscopic photographs by means of lenses. By this means, as in ordinary binocular vision, we get the impression of depth or perspective when viewing a solid object having points in more than one plane. As applied to radiography, we use, of course, no lens, but, after having taken one picture, we displace the tube two and a half inches, the movement being made parallel to the surface of the photographic plate, and make a second exposure. The second device is used to enable us, after taking one picture, to remove the exposed plate and to substitute for it another, which shall occupy exactly the same position as the first did, and that without disturbing the object to be pictured. For holding the X-ray tube above the body of the patient and permitting the move-

ment of the tube through a measured distance, I find the following apparatus convenient:

A heavy cylindrical bar of hard wood, two inches in diameter, is fixed vertically to one side of the table. This bar may be moved vertically a measured distance, or horizontally from one end of the table to the other, and may, moreover, be rotated on a vertical axis and fixed in any desired position by means of a friction clamp fastened to a travelling-block which slides in horizontal grooves along the side of the table. Two other sliding blocks, one on either side, serve as guides to any predetermined position of the first. From the upper end of this vertical arm there extends a horizontal arm of wood long enough to permit the X-ray tube to be suspended from it by means of a heavy wooden clamp over any point across the width of the table. This horizontal arm is scaled in inches, so that the clamp which carries the tube can be moved along it a measured distance. The clamp, also of wood, hangs vertically downward from the horizontal arm, and at its lower end bears a pair of grooved jaws padded with rubber so placed that when the horizontal arm is at right angles with the long axis of the table, the X-ray tube is very firmly held with the plane of the anticathode at an angle of forty-five degrees with the surface of the table, and with the long axis of the tube parallel with the long axis of the table. The construction of this gallows-frame, as it may be called, is of hard wood and very heavy for the sake of rigidity. Metal should be avoided as far as possible in its construction. The vertical arm is so graduated in inches that the observer may read at a glance the distance from the centre of the anticathode of the tube to the photographic plate beneath it on the table. (Figs. 1 and 2.) The rotation of the whole gallows-frame upon a vertical axis is very convenient. By means of this device the tube may be accurately adjusted over any desired point of the table. The horizontal arm may then be rotated to a position which permits the patient to get upon the table without risk of injuring the apparatus. After the arrangement of the patient upon the



FIG. 1.—Table for stereoscopic radiography.



FIG. 2.—Patient in position on table for a stereoscopic radiography.

table, the gallows may be rotated to its former position and the exposure made.

The second device necessary permits the removal of the photographic plate from beneath the patient and the substitution of a second photographic plate without moving the patient. For those who desire seriously to interest themselves in practical radiography, the possession of a special table adds greatly to the convenience of the operator. I have found a table constructed upon the following plan convenient: The table is made of hard wood, built heavily for the sake of stability. It is six feet long, nineteen and a half inches wide, and thirty-four and a half inches high, and is supported upon eight strong wooden legs. The upper surface of the table contains three rectangular openings, one in the centre of the table and one at either end. These openings are seventeen and three-quarters inches long and fourteen and three-quarters inches wide. This corresponds to the size of fourteen by seventeen X-ray plates in their envelopes. Over the entire top of the table is stretched a sheet of pegamoid with a canvas backing, held under tension by a row of brass-headed tacks around the edge of each opening, and further by a half-round moulding nailed to the edge of the table. The solid portions of the upper surface of the table are padded with a sheet of felt slightly thicker than an X-ray plate included in its envelopes.

Beneath the table, and corresponding accurately in size and situation to the openings above described, are three wooden plate-carriers which slide vertically up and down in suitable guides. (Figs. 1 and 2.) Each carrier is raised and lowered by means of strong wooden supports beneath the table arranged in the form of a toggle-joint. When the elbow of the joint is straightened, the plate-carriers are raised and pressed firmly upward against the pegamoid covering of the table. When bent, the plate-carriers descend and permit the introduction or removal of the photographic plates. A suitable space is provided for this purpose at one side of the table.

The position of the plates upon the carriers is accurately fixed by means of wooden kits of different sizes. The lower

limbs of the toggle-joints are pivoted beneath the table upon a heavy iron bar which extends the whole length of the table. The weight of the patient's body overlying the carriers is thus firmly supported. Upon the pegamoid surface of the table the position of the several sizes of plates is clearly marked by shallow grooves in the cloth corresponding to the situation of the plates beneath. The part to be pictured may thus be arranged upon the surface of the table with reference to the underlying plate. Along either border of the table and below the level of its upper surface, three pairs of metal knobs or buttons are fastened opposite to each opening. To these buttons thin leather straps are affixed at pleasure. They may be buckled across the part to be pictured, thus securing complete immobility during the exposure.

For those who do not possess a special table, the following device is inexpensive and fairly satisfactory. Upon a framework of planking, two feet long and as wide as the table which is to be used for taking radiographs, are nailed two little cleats or strips of wood, one-quarter of an inch high, running cross-wise from one side of the planking to the other, separated by a distance a little greater than the width of the envelope which encloses that size of photographic plate which is to be used. Across the top, from one strip of wood to the other, is tacked a sheet of stiff fibre-paper, as it is called. A shallow wooden drawer or plate-carrier is made of such a size and depth that it slides easily in and out between the strips of wood and beneath the fibre cover.

The part to be radiographed is placed upon the fibre covering; the plate in its envelope is then put into the wooden drawer, which can be easily inserted beneath the fibre cover. A picture having been taken, the drawer is pulled out, the plate removed, a new plate inserted beneath the part to be pictured, and a second picture taken. It is sometimes necessary, and usually wise, to hold the part to be pictured absolutely quiet by strips of adhesive plaster stuck to the skin of the patient and to the table.

If the tube has been moved horizontally two and a half

inches after taking the first picture, the two negatives, when developed, constitute stereoscopic pictures, and may be at once viewed in the reflecting stereoscope.

Another method of taking stereoscopic pictures is to have a plate-holder so constructed that one-half the contained photographic plate is shielded from the action of the rays—by a heavy sheet of metal. After exposing one-half the plate, that half is shielded by the metal screen and the other half is brought beneath the patient.

The tube is moved a suitable distance, and a second exposure is made. The two pictures thus lie side by side upon the same plate, and may be copied in a reduced size, and viewed as positives on glass or paper in a refracting stereoscope. For viewing stereoscopic radiographs, two forms of apparatus may be used, first, the Wheatstone Reflecting Stereoscope, which permits us to examine X-ray negatives of any size immediately after they have been developed. Manifestly, a great saving of time, for it is possible to examine the plates in a stereoscope within an hour of the time they have been taken, or the negatives may be reduced in size to three and a quarter by four, mounted side by side, viewed as positives on glass or on paper in the refracting stereoscope in common use.

The principle of the Wheatstone Reflecting Stereoscope is as follows: Two rectangular plane mirrors are fixed upon a suitable wooden frame, so that two of their edges being in contact, their surfaces stand at an angle of ninety degrees to one another.

If, now, an observer places his eyes one on either side of the apex of the angle made by the mirrors, and if stereoscopic pictures of any object be placed one opposite each mirror, the surface of the picture making an angle of forty-five degrees with the planes of the mirrors, the observer will see the reflected image of the right-hand picture with his right eye and the image of the left-hand picture with his left eye. And if the adjustments are suitable, the brain will combine the two images into a single image, which will appear in relief. This principle may be utilized for viewing radiographs in two ways.

Prints may be made from stereoscopic X-ray negatives and placed one upon either side of the mirrors. The advantage of this method is that a very simple form of apparatus answers perfectly. Two pieces of plane glass mirror stuck together along one straight edge and placed upon a table at right angles to one another, with the apex of the angle directed towards the observer's eyes, answers as well as anything.

The photographic prints are placed one on either side, supported by a grooved block of wood. Daylight furnishes a satisfactory illumination.

The disadvantages are, the time and trouble necessary for the preparation of the prints, the inability to view the pictures for at least forty-eight hours after they have been taken, and the loss of detail which occurs when printing on paper from X-ray negatives, unless unusual care and skill are used in the process.

Second. The original X-ray negatives may be viewed by transmitted light in the Wheatstone Reflecting Stereoscope. The advantages of this method are that the stereoscopic effect is appreciated in a very satisfactory manner, that none of the details are lost, that the plates may be viewed in the stereoscope immediately after development, within one hour after the time the pictures are taken, a practical advantage of great consequence in cases of recent fractures and dislocations. And in cases where foreign bodies are to be detected and located, the time and trouble of preparing the print are saved. The disadvantages are that a somewhat more expensive and complicated apparatus is necessary to produce satisfactory results. The plates must be illuminated by a source of artificial light placed on either side of the plane mirrors. The light must be diffused; hence, it is necessary to interpose in front of each light a screen of ground glass or opal glass. In front of the screen on either side are placed the X-ray negatives. The centre of each negative should be nearly opposite the apex of the angle made by the mirrors. (Fig. 3.)

This apparatus may be constructed in a simple form at a cost of less than five dollars. The mirrors, six inches square

or thereabouts, may be set in grooves on a block of wood; other grooved blocks of wood may be placed on either side to hold the plates and the pieces of ground glass. Two electric-light bulbs or two oil lamps, one on either side, serve as a source of light. Any ordinary desk or table furnishes a level base for the entire apparatus. The smallest practical experience only is necessary to arrive at a knowledge of the best relative positions of the several portions of the stereoscope. In order to obtain the very best effects, a somewhat costly and elaborate mechanism is desirable. With the apparatus already described,

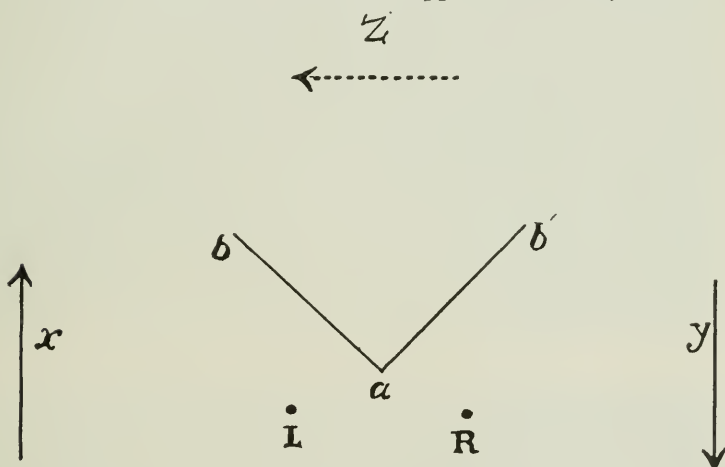


FIG. 3.—Diagram to show arrangement of planes and mirrors for the Wheatstone Reflecting Stereoscope. R and L represent the position of the right and left eye of the observer; ab and ab' the mirrors; x and y the stereoscopic pictures, and Z the apparent position of the stereoscopic image seen.

the diffused light of the room, together with reflections and shadows of one sort or another, serve to obscure to some degree the finer shades of different density in the X-ray negatives; and since the proper interpretation of these slight differences is often of great consequence in the diagnosis, any device which serves to preserve these qualities of the negatives as perceived by the eye is a distinct advantage.

I have found that enclosing the whole apparatus in a nearly light-tight box serves this purpose well. A small square

aperture is left in front of the box opposite the apex of the angle made by the mirrors through which the observer looks. The Folmer and Schwing Manufacturing Company of New York have made for me a stereoscope of this kind. Its construction is as follows:

A heavy frame-work of wood, five feet in length and one foot wide, serves as a base for the apparatus. The frame-work bears upon its surface polished wooden tracks, upon which rest wooden blocks bearing tracks at right angles to those beneath. The several parts of the apparatus bear upon these tracks, thus permitting motions in two directions, namely, along the length of the plank and at right angles thereto. The mirrors in the centre and the plate-holders upon either side are enclosed in a light-tight box of wood and leather.

An orifice four and a half inches square is left in front of the box opposite the apex of the angle made by the mirrors. The plate-holders permit the use of plates measuring eleven by fourteen inches and eight by ten inches. In addition to the horizontal movements, the plate-holders may be moved vertically up and down by means of a rack and pinion. These movements of the plate-holders in three planes permit any desirable adjustment to be made. The interior of this central portion of the apparatus is painted a dead black. Upon either side opposite to the plate-holders is a sheet-iron box lined with opal glass, and containing twelve sixteen-candle power electric-light bulbs. These may be illuminated in groups of six. The sides of the boxes towards the plate-holders contain a groove for the reception of a sheet of opal glass, ground glass, or colored glass; or, by a combination, the light may be passed through colored glass and ground or opal glass at will. When using the apparatus, the negatives are placed in the frames, the lights are turned on, and the observer places his eyes in front of the window in the centre of the mirror-box. The images are then seen in the two mirrors with the right and left eyes respectively. By moving the mirrors a little away from or towards the eyes, the two images unite and form a single



PLATE I.—Renal and ureteral calculus. Male, aged forty-one years; large calculus in the left kidney forming a cast of the dilated pelvis and calyces. Small stone in the ureter of the same side; the patient, a man of medium size, weighing about 140 pounds. Fifteen-inch Willyoung coil; Welmelt interrupter; Dr. E. Grünmach's cold-water tube. Resistance of tube equivalent to five inches of spark-gap in air. Distance of tube from plate twenty-six inches; exposure, seven and a half minutes; Cramer X-ray plate; hydrochinon and bromide developer.



PLATE II.—Fracture of the femur in a child nine years old. The picture was taken nine weeks after the injury; the periosteal bridges along which the new-bone formation has taken place are well shown. In the original negative two scybalous masses in the pelvis are shown stereoscopically in a striking way. The distance of the tube from the plate was twenty-six inches; exposure, four minutes; Dr. E. Grinnach's cold-water tube; vacuum equivalent to four inches of spark-gap in air. Cramer X-ray plate; hydrochinon and bromide developer.



PLATE III.—Old fracture of tibia and fibula. Adult male. Union with deformity. Conditions of exposure as in the other plates. Exposure, four minutes. The same plates and the same developer as in the other figures.



PLATE IV.—Fracture of the shaft of the humerus. Union with deformity, six weeks after injury. Exposure, three minutes.
Other conditions as in Plate II.

stereoscopic picture. The stereoscopic effects produced with this apparatus leave nothing to be desired.

Another method of viewing stereoscopic X-ray pictures is to photograph the two negatives in a reducing camera. The pictures should be reduced to lantern-slide size, viz., three and one-quarter by four inches; thus two positives on glass are produced. These are then mounted side by side on a plain glass backing, and are viewed most conveniently in a refracting stereoscope enclosed in a bellows. In order to produce the best effects, a piece of ground glass should be inserted between the pictures and the source of light.

The Folmer and Schwing Manufacturing Company have made for me a refracting stereoscope which answers the requirements exceedingly well.

For the reduction of X-ray pictures to be viewed in the refracting stereoscope, the methods used for the making of lantern-slides answer well. Slow plates should be used, three and a quarter by four inches in size, and to get the greatest amount of detail, a small diaphragm and a long exposure, about one hour for ordinarily dense negatives, with skylight reflected from a mirror on a cloudy day and passed through a sheet of ground glass. A developer giving great contrast and slow development, hydrochinon and bromide, for example, is desirable. Direct light from the sky is best: it may be obtained in the city by the use of a large mirror set outside the window at an angle of forty-five degrees with the vertical, the skylight being thus reflected into the room. In order that the two pictures may combine in the stereoscope, they must occupy the same relative position on the two plates. In order to accomplish this, I have found the following procedure useful: After the image of the large plate is accurately focussed on the ground-glass screen, best by first focussing on some printed matter or the like, and then substituting for it the X-ray negative. Measurements in two directions at right angles one to the other are taken from some bony point and line of the reduced images to the edges of the ground-glass screen. There measurements are noted, and the image of the second nega-

tive is made to conform precisely to them. The two pictures when mounted will be found in the correct position. These reduced stereoscopic positives on glass are very satisfactory, and appeal strongly to those who are unaccustomed to examine and interpret X-ray negatives.

There is usually one relative position in which stereoscopic pictures show to the best advantage. They are, so to speak, rights and lefts. If the picture taken when the tube was farthest to the right is viewed with the right eye, and the other with the left eye, the stereoscopic image will appear with the dorsal or ventral surface of the limb towards the observer, according as the ventral or dorsal surface was next the photographic plate. If the position of the pictures is reversed, the limb will appear as though looked at from the opposite surface, and usually one of these arrangements is optically more satisfactory than the other. The apparent point of view may also be changed by turning the separate pictures to face the other way without changing their relative positions; but once mounted together side by side in permanent relation, no amount of turning will change the apparent point of view; so that if it is desired to view the pictures from both directions, they must either be kept separate or else two pairs must be mounted in different relative positions.

In taking X-ray pictures for stereoscopic effects, it is desirable that distortion of the image should be avoided as far as may be. A distance of from twenty-six to twenty-eight inches from anticathode to photographic plate is sufficient to prevent undue distortion, unless both hip-joints of an adult are taken on one plate, in which case it is better to remove the tube still farther away. To formulate any rule for determining the proper time of exposure in a given case is very difficult. The operator must know what his apparatus is capable of doing, and experience is the only guide. The tendency is to underexpose rather than the contrary.

PROSTATECTOMY BY THE PERINEAL ROUTE.¹

By PARKER SYMS, M.D.,

OF NEW YORK.

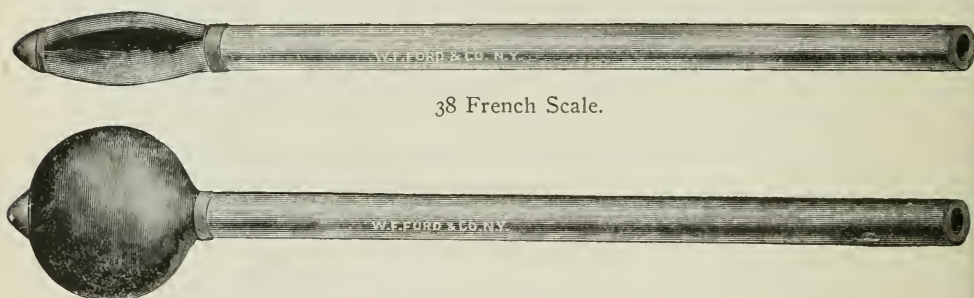
IN a paper entitled "Prostatectomy," which was read before the New York Surgical Society on November 9, 1898, I expressed my opinion that prostatectomy performed through the perineum and without opening the bladder suprapubically was safer than the procedures which do involve suprapubic cystotomy. My reasons for this opinion, it seems to me, must be obvious. There is less cutting, less time involved, and there is avoided the danger of infection which would arise from exposing the prevesical space to the contaminating influence of infected urine. After the operation the patient is in a much simpler and less complicated condition, having his bladder drainage entirely through the perineum and in the line of gravitation, than is one who has a suprapubic wound alone or combined with a perineal section.

In this same paper I proposed as a modification of Alexander's operation that one should do a laparotomy just above the bladder fold but not opening this organ, whereby one might push the prostate, bladder and all, towards the perineal wound and proceed with his bimanual enucleation. This suggestion I have never put into practice, but in October, 1899, Dr. Alexander Johnson originated and employed what I believe to be an important modification of it. He obtained his means of pressing the prostate down by making an opening into the prevesical space below the peritoneal fold, whereby he could introduce his finger without opening the bladder. Dr. Johnson and others have used this method with satisfaction and success. Among

¹ Read before the New York Surgical Society, November 13, 1901.

the other aids to perineal prostatectomy, I desire to call attention to a bladder retractor which I presented to the profession at the June meeting of the American Medical Association in 1900. It consists of a rubber tube of a calibre of 38 French scale, having a rubber bulb attached to one end, which can be dilated when it is introduced into the bladder. (Fig. 1.)

With the aid of this instrument, the operation is performed as follows: The patient is placed in the lithotomy position, under ether narcosis; a median perineal section is made extending from the bulbous portion of the urethra as far back as is safe without injuring the rectum. The membranous urethra is exposed by dissecting backward until the tip of the prostate is reached; an opening about an inch in length is made



38 French Scale.

Dilated to two and a half inches by water.

FIG. 1.—Parker Syms's bladder retractor for perineal prostatectomy.

in the membranous urethra, a staff having been introduced into the bladder; the bladder is now carefully irrigated, the prostatic urethra is dilated, and then the rubber retractor, collapsed, is introduced through this opening in the membranous urethra so that the bulb is well within the bladder: then this bulb is dilated to a diameter of two and a half inches by injecting two and a half ounces of water through the tube by means of a piston syringe: the tube is then clamped to prevent the escape of the water; firm traction is made on this tube, and then it is turned well up over the perineum and held there by an assistant; it will not be in the operator's way, and it will be found that this traction holds the neck of the bladder and the prostate from receding, and gives the requisite fixation

to enable one to enucleate the diseased lobes. Now the capsule of the gland is entered and the lobes are enucleated by the index-finger; in this enucleation I believe the prostatic urethra will be torn through quite frequently; I have done this in several instances, but without prejudicing the final result of the case. In some instances the enucleation will be accomplished with comparative facility, though it must not be assumed that prostatectomy is ever an easy operation. In some cases of small obstructing prostate enucleation may be most difficult, but so far I have always been able to remove the obstructing mass.

In this connection I desire to call attention to an ingenious instrument which Dr. J. W. S. Gouley has devised as an aid to

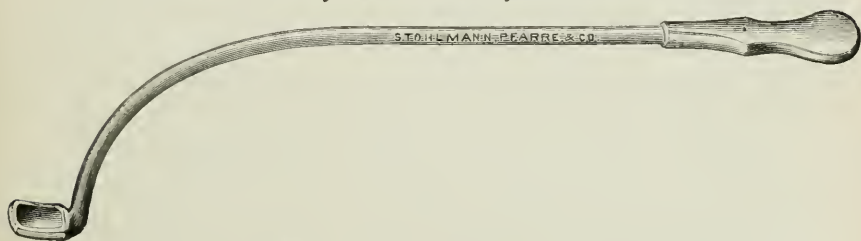


FIG. 2.—Dr. J. W. S. Gouley's prostate depressor for perineal prostatectomy.

perineal prostatectomy. It is like a double-curved bladder staff with an expanded flat distal extremity. (Fig. 2.) It is introduced through the opening in the membranous portion of the urethra into the bladder, and is used for making counter-pressure from within. It will undoubtedly be found to be a valuable aid in many cases.

The after treatment of perineal prostatectomy is very important, but is very simple. A drainage tube is introduced through the opening into the membranous urethra into the bladder, and is retained in place by one stitch. All the wound is carefully packed around this tube, the bladder is kept scrupulously clean by repeated washings, and is emptied by continuous drainage; on the fourth or fifth day the gauze packing is removed, and on the fifth to seventh day the drainage tube is removed. Sometimes I have replaced the drainage tube with

one of small size on the fourth or fifth day. My patients have been out of bed beginning anywhere from the seventh to the tenth day. During the healing the anterior urethra must be irrigated frequently, and as soon as the wound has begun to fill up with granulations, a full-sized sound should be introduced through the urethra into the bladder,—at first every three days, and later at longer intervals until healing is complete. This will take from three to six weeks. Some patients will have control of the bladder as soon as the tube is removed; usually this is not the case, and there will be leakage for a variable period.

In three of my patients there persisted incontinence of urine after complete healing,—in two of the cases for a few weeks, and in one of the cases for about three months, but finally these men have all regained control. In none of my cases, nor in any that have come to my notice, has there been any such thing as stricture following this operation.

So far I have done but thirteen prostatectomies. My second case was incomplete, owing to the fact that there was a prevesical abscess resulting from a former suprapubic cystotomy, so that I did not deem it wise to open the bladder above at that time, and it was before I had devised my retractor, so I found myself unable to properly reach and enucleate the prostate through the perineum. Three of my patients are recent ones; they are doing well, but their final result cannot yet be estimated. My remaining cases have all done extremely well, having been relieved completely of the symptoms from which they formerly suffered, being able to control their bladders to empty them voluntarily, having no cystitis, no frequency, no pain, and no irritation.

In conclusion, I would say that I believe prostatectomy to be a thoroughly practical and proper surgical procedure in suitable cases; that when it is to be employed it should be done early and not left as a last resort, and I would also reaffirm that I believe prostatectomy by the perineal route to be the safest method thus far proposed for the radical cure of these great sufferers.

INTESTINAL OBSTRUCTION FROM MECKEL'S DIVERTICULUM.

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PROFESSOR OF SURGERY IN THE CHICAGO POLICLINIC; ATTENDING SURGEON TO
THE COOK COUNTY HOSPITAL AND THE CHICAGO BAPTIST HOSPITAL.

C. L., aged twenty-five years, was admitted to the Cook County Hospital August 10, 1901. Shortly after admission, the following history was obtained: Family history, negative; past history, has had the usual diseases of childhood. At the age of four was confined to the bed for several days by an illness that was called inflammation of the bowels, and that was attributed, by the family physician, to a fall upon the abdomen. At this time the intestines were said to have been injured. Since the age of four years he has had several attacks of severe abdominal pain associated with obstinate constipation and vomiting. The last attack, which occurred about two and one-half years ago, was the most severe. At this time he was confined to the house for one week.

Present Illness.—This began two days before admission. While at breakfast, he was suddenly seized with intense abdominal pain, colicky in character, and distributed over the whole abdomen. Shortly after the onset of the attack, he vomited. The pain has since that time increased in severity. The abdomen has become more and more distended and more sensitive to pressure. All efforts towards securing a movement of the bowels have been unsuccessful. No gas has escaped from the bowels. The vomiting has continued at intervals of about two hours since the beginning of the attack. The matter vomited has not changed in character, remaining free from faecal odor and consisting of a semitransparent, slightly bile-stained fluid.

Examination shows a well-nourished, vigorous appearing young man, with no evidence of congenital deformity. The face

is rather drawn and has an anxious expression. Lungs and heart negative. The abdomen is distended somewhat more above the umbilicus than in the lower half, and perhaps a trifle more in the right than in the left side. On percussion, there is a uniform, tympanitic note. No dulness in any part. Liver dulness present, but displaced slightly upward. Palpation shows the abdomen to be somewhat sensitive to pressure, the most painful part being the right side, just above the anterior superior spine of the ilium. No peristaltic movements visible, no evidences of external hernia. Rectal examination negative.

During the afternoon of the day of admission, the patient continued to vomit and his pain increased. High rectal enemata were given, but failed to bring away any gas or fecal matter. When admitted at 10 o'clock A.M., his pulse was 102 and his temperature 100° F. At 8 P.M., the pulse was 114 and the temperature 101.2° F. At 11 P.M., the pulse was 120 and the temperature 103° F. The vomiting had become more frequent and the pain had steadily increased in severity.

Operation at 12, midnight. After taking into consideration a history of repeated attacks and the character of the symptoms, a diagnosis was made of obstruction, either from a congenital band or from adhesions resulting from an old appendicitis. An incision was accordingly made to the outer edge of the right rectus muscle, about on a level with the umbilicus. As soon as the peritoneal cavity was opened, a loop of distended intestine was seen. This was pulled out and traced downward for about eighteen inches, when there was found a constricting ring. Immediately below this the intestine was collapsed. On close inspection, the ring was found to be made up of a Meckel's diverticulum, to the distal end of which was attached a fibrous cord. The diverticulum was somewhat larger than the ileum, from which it originated, and was about two and a quarter inches in length. The terminal ligament measured about three inches, and was continuous with the root of the mesentery, a short distance below the point of origin of the diverticulum. The diverticular ligament contained a blood-vessel, apparently a vein, which was filled with blood, and which seemed to communicate with the mesenteric vein. The diverticulum and ligament together formed a ring through which a loop of intestine had passed and was strangulated. No volvulus. The diverticulum was given off about fifty

centimetres from the ileocaecal valve. The part of the intestine forming the loop which passed through the ring was the ileum, below the point of origin of the diverticulum. The terminal ligament was ligated close to the mesentery and divided; gas immediately passed into the collapsed gut, and through the ileocaecal valve. The diverticulum was amputated close to the margin of the gut, leaving a longitudinal opening two inches in length in its convex side. This was closed by the Connell through-and-through suture of silk. The bowel was restored to the abdominal cavity and the abdomen closed. There was no fluid in the peritoneal cavity. The intestine was red, injected, and oedematous, but the peritoneal gloss was not lost, and there was no evidence of any serious nutritional change in the bowel. The day following the operation the bowels moved freely, and recovery was uninterrupted. The patient was discharged recovered on September 7, 1901.

The malformation generally known as Meckel's diverticulum was described first by Ruysch.¹ Its congenital nature was also considered by him. The origin of this structure from the vitelline duct was pointed out by Morgagni.² Meckel,³ although crediting the early writers with possessing a knowledge of this diverticulum, claimed to be first to explain its origin and to call attention to its presence as a frequent cause of disease. The origin of Meckel's diverticulum may be briefly explained as follows:

About the end of the third week of foetal life in the human embryo, the primitive intestine communicates with the umbilical vesical by means of a tube, the omphalomesenteric duct. During the process of closure of the abdominal parietes, which takes place during the fourth and fifth week, this disappears, excepting a thread-like remnant, which passes from the convex border of the loop of the ileum nearest the umbilicus to the umbilicus or the abdominal wall near by. This thread-like structure usually disappears as the development of the intestine progresses. Most of the growth takes place above the attachment of this cord. This forms the greater part of the small intestine. The portion below forms the remaining part of the

small intestine and the large intestine. When the developmental change in the vitelline duct is not completed, there remains a tube or cord, more or less permanently attached to the umbilicus. When a diverticulum exists in its most perfect form, it consists of a tube similar in structure to the small intestine, of varying length, and attached to the umbilicus. In these cases a congenital, umbilical, faecal fistula usually exists. This may or may not close spontaneously after birth. In a case cited by Treves,⁴ the umbilical fistula appeared first when the child was three weeks old, and persisted for seven years, and then closed spontaneously. In other cases, the tube ends in a blind extremity, and either hangs free in the abdominal cavity or is attached to the umbilicus or mesentery, or some other abdominal organ, by a fibrous band called the terminal ligament. In many cases the cord breaks from its attachment to the umbilicus and hangs free in the peritoneal cavity. It seldom attaches itself to other structures. The origin of this terminal ligament is the persistence in a varying state of atrophy of the vessels that accompany the vitelline duct. These are the omphalomesenteric artery and vein. During the atrophy of the vitelline duct, these arteries and veins usually disappear, but atrophy of the duct is not necessarily accompanied by disappearance of these vessels. The existence of the omphalomesenteric vascular remains was well known to Meckel,³ and their transformation into a fibrous band which might prove a serious menace to life was likewise appreciated by him. In his classification of internal hernia, he mentions, as one of the causes of strangulation, the "presence at the summit of a loop, a diverticulum of the ileum, with a filament, the remains of the omphalomesenteric vessels, which may become attached and be the cause of obstruction." For many years, explanation of the origin of the terminal ligament, as given by Meckel, was apparently not accepted or not known. In most of the earlier cases reported, and, in fact, up to the time that Fitz⁵ published his paper on "Persistent Omphalomesenteric Remains," the fibrous cord, either hanging free from the distal end of the diverticulum or attached, was gen-

erally regarded as of inflammatory origin. It may be said that the existence of inflammatory adhesions between the diverticulum or its ligament and the neighboring organs rarely occurs, and but few authentic cases are found in the literature. Those in which it is said to have been attached to the mesentery by inflammatory adhesions are probably remains of omphalomesenteric vessels which retain their mesenteric attachment. The original points of attachment of these vessels were the intestines, the mesentery, and the umbilicus. Any one or two of these may be severed. Usually, we find the cord attached to the intestine or diverticulum, and, by its distal end, to the umbilicus or mesentery. In a case reported to the author by Dr. Henrotin, the terminal ligament of a diverticulum had become adherent to an inflammatory exudate about the stump of the appendix and caused obstruction about eight days after an operation for appendicitis. It is a well recognized fact that attached diverticula are more often the cause of obstruction than those that are free or unattached. The relative frequency of the points of attachment of the distal end of a Meckel's diverticulum or its terminal ligament is of interest as bearing upon the treatment of this form of obstruction. Treves⁴ quotes Cazin's statistics in twenty-three reported cases in which he found the distal end attached to the umbilicus in three, to the small intestine in six, to the mesentery in ten, to the cæcum in two, to the inguinal ring in one, and the colon in one. In twenty cases collected by himself, he found diverticula attached near the umbilicus in seven, to the mesentery in seven, to the bladder in one, the femoral ring in one, the small intestine and cæcum in one. Kammerer,⁶ taking the cases of Neumann⁷ and those of Boldt⁸ not included in Neumann's list, together with ten cases that he collected, found that of the sixty-six cases, thirty-three were attached to the mesentery, thirteen to the umbilicus, and twelve were attached to some part of the intestinal tract or to other abdominal viscera.

Of the sixty-nine cases reviewed by the author, there are forty-eight in which the attachment was noted. Of these, twenty-three were attached to the mesentery and fifteen to the

umbilicus. The attachment to other abdominal organs was, to the small intestine, three; to the omentum, one; to the transverse mesocolon, one; to mesorectum, one; to peri-appendicular exudate, one. In three the exact point of attachment could not be determined. The attachment to points other than the mesentery and umbilicus is of slight importance to the surgeon, because it is probably due to inflammatory adhesions, and therefore accidental, and for this reason no estimate can be made of the relative frequency with which it may occur.

It is generally stated that Meckel's diverticulum, or at least some omphalomesenteric remains, are found in from 1.25 to 2.5 per cent. of all bodies examined. The latest statistics relative to the frequency of this anomaly are those of Kely-nack.⁹ He found it present eighteen times in 1446 post-mortem examinations. Of these, eleven were males and seven females. In none did its presence bear any causal relation to death. He therefore concludes that it is of slight practical importance. In 3400 examinations in St. Bartholomew's Hospital, there were twenty-seven in which Meckel's diverticulum was found, making about one in every 126 bodies.

The frequency of intestinal obstruction from Meckel's diverticulum is difficult to state, as the statistics bearing on this point are of comparatively little value. In many of the recorded cases, accurate examination of the exact anatomical conditions have not been made, so that in not a few there is doubt as to the existence of a true Meckel's diverticulum. Most of the reports show that there is a general lack of knowledge concerning this important developmental defect.

The older statistics are particularly misleading, in that the appendix was frequently confused with the true Meckel's diverticulum. Bands, undoubtedly remains of omphalomesenteric structures, were even up to recent years generally regarded as inflammatory in origin. Taking the cases reviewed by Leichtersterne,¹⁰ we find that in 1134 cases of intestinal obstruction, 39 per cent. were due to intussusception, 9 per cent. to bands and adhesions, and 6 per cent. to diverticula. Of the combined cases collected by Haven,¹¹ Duchanssoy,¹² and Brin-

ton,¹³ making in all 991, in about 6 per cent. Meckel's diverticulum was the cause of obstruction. These figures, though far from accurate, undoubtedly show that obstruction from Meckel's diverticulum is relatively common, and probably occupies the place next to intussusception as the cause of intestinal obstruction.

The manner in which the intestine may become obstructed in a Meckel's diverticulum is of great importance to the surgeon. A thorough knowledge of the possibilities in any individual case will often permit him to give prompt relief by directing him at once to the seat of obstruction, which might, under the opposite conditions, be overlooked. In reviewing the reports of cases operated upon, we often find that, after the abdomen has been opened, the cause of obstruction could not be found, and was only discovered at the autopsy. The post-mortem reports of these cases fully demonstrate, in many instances, that the operator lacked knowledge of the anatomical peculiarities of this region.

In considering the ways in which Meckel's diverticulum may cause obstruction, we can separate the cases into two groups: (1) Those in which the obstruction is produced by a free or unattached diverticulum, that is, having only one attachment to the intestine; (2) those in which the diverticulum or its terminal ligament is attached to the abdominal wall or to some viscus.

Intestinal obstruction from a non-attached Meckel's diverticulum is comparatively rare. When it occurs, the obstruction is brought about in one of the following ways:

First. The gut, usually the ileum, is snared by a noose, or a knot of more or less complicated structure is tied about a loop of the gut. In some cases the free diverticulum in reality forms a volvulus with the loop of gut inside the twist. Adhesions commonly form, binding the two arms of the twisted and inflamed diverticulum together, and thus constrict the bowel. Such a mode of strangulation is pictured by Treves in his work on intestinal obstruction. (Fig. 14, p. 48.) In other cases, a complete knot is tied in the diverticulum, about a loop

of intestine. In order that such a knot may be tied, Nothnagel¹⁴ finds that certain peculiarities of the diverticulum must exist. (1) It must be of unusual length; (2) it must be pear-shaped, or, at least, have a knob-like distal extremity; (3) it must possess a great range of mobility. Such a case is reported by Hohlbeck.¹⁵ In this case the diverticulum was twenty-three centimetres long, and was considerably larger at the distal end than at its base. A loop of eighty centimetres of intestine was strangulated inside of a complete knot of the diverticulum. The gut was resected, and an end-to-end union by Murphy's button was followed by recovery. Double knots have also been found, according to Treves. None of these have been described in any of the cases reviewed by the author.

Second. Obstruction from kinking of the intestine at the point of attachment of a diverticulum may result from dragging of a loop of the intestine, by an unattached, distended, or cystic diverticulum, without any structural change occurring in the intestinal wall. If this traction and kinking are continued for any considerable time, necrosis of the gut at the acute angle formed usually occurs. An instance of this kind of obstruction is reported by Walzberge.¹⁶ In his case, necrosis of the gut at the point of attachment of the diverticulum had already taken place. Acute flexion of the intestine occurs more frequently when the distal end of the diverticulum or its ligament is attached. When a free diverticulum is caused by kinking of the gut, it must be of good size and of considerable weight. Usually, it is found filled with faecal matter or concretion, or its lumen is obliterated at the point of attachment to the intestine, and its distal end has undergone cystic degeneration.

Third. Twisting of the bowel on its long axis at the point of origin of the diverticulum itself is a frequent cause of obstruction. In these cases, as in the preceding form, the diverticulum is usually large and distended, and necrosis of the bowel is common. In a second case reported by Walzberge¹⁶ this mode of obstruction was found post-mortem. The cause of obstruction was not determined at the time of operation. At the autopsy, a cystic diverticulum was found, the base of

which was twisted until the lumen was completely obliterated. A portion of the wall of the intestine close to the insertion of the diverticulum was twisted and necrotic. A case of volvulus of the small intestine, caused by twisting of the diverticulum, which hung free in the pelvis, is reported by Good.¹⁷ Another interesting case of obstruction, resulting from twisting and kinking of the intestine from an unattached diverticulum, has recently been reported by Taylor.¹⁸ In this case the diverticulum was enormously distended and twisted three times at its base. The twisting and traction had caused obstruction at the point of origin of the diverticulum.

Fourth. Chronic inflammation of the diverticulum and of the adjacent portion of the intestine, with cicatricial narrowing of the gut just above the diverticulum, can be the cause of obstruction. This may happen in free and in attached diverticula. The diverticulum becomes filled with faecal matter or concretions, and the resulting inflammation extends to the intestine, ulceration and cicatrization follow, and obstruction finally develops. In some cases, congenital narrowing of the gut at this point may be the cause of obstruction. Some writers consider that in cases of stenosis of the bowel, at or near a diverticulum, the condition is always congenital. Cases are on record, however, where the bowel was found in an ulcerated state at the time of death. In most of the cases where there is stenosis of the bowel, either congenital or inflammatory, the symptoms of chronic obstruction antedate the acute strangulation. The latter develops when the bowel becomes occluded by faecal matter lodging at the constricted point.

Fifth. Inversion of the mucous membrane alone, or of the entire diverticulum, with or without invagination of the segment of the gut just below the diverticulum, is an occasional cause of obstruction. An interesting case is reported by Hohlbeck,¹⁵ where, with an invagination of one-half foot in length of the ileum, the mucous membrane of the diverticulum was found completely separated from its muscular wall, excepting where it was continuous with the intestinal mucous membrane, and inverted into the lumen of the gut. This evidently had

been the chief factor in the production of the intussusception. Treves ⁴ describes a specimen of invagination of a diverticulum of the ileum which is in the Guy's Hospital Museum. Küttner ¹⁹ collected seven cases from the literature, and reported one of his own. Stubenrauch ²⁰ reports one, as does also de Quervain.²¹ It may also be mentioned that inversion of the diverticulum may occur without producing any symptoms during life. Heller ²² found one post-mortem, which hung freely in the lumen of the gut without causing any disturbance. Obstruction from inversion of the diverticulum may be the result of mechanical hinderance to the fæcal currents by the presence in the lumen of the gut, of the inverted diverticulum, or by the diverticulum being drawn down the intestinal canal by the fæcal current, and by this traction causing an intussusception. Of the twelve cases reported belonging to this group, in eight intussusception was associated with inversion of the diverticulum; in four, inversion of the diverticulum alone was present.

The conditions essential in the development of an inversion or invagination of the diverticulum are that it must be of considerable size circumferentially, and that it must be free. Probably the starting-point of an invagination is when a concretion or a fæcal mass is emptied from its lumen into the intestine. Separation of the mucous membrane, as in Hohlbeck's case, can also best be explained in this way.

Strangulation from an adherent diverticulum is more common than from one that hangs free in the abdominal cavity. The methods by which an attached diverticulum may produce strangulation of the gut are as follows:

First. By the diverticulum acting as a band, in the same manner as an adventitious band or a peritoneal adhesion would produce obstruction by constricting the lumen and interfering with the circulation in a loop of intestine that had passed underneath it. Treves considers it impossible for a diverticulum that is attached to the abdominal wall at the umbilicus, and thus stretched across the cavity, to produce obstruction in this way. Many cases of this kind are reported. The intestine is probably

twisted around the diverticulum in some way, so that the twist constricts the gut rather than the band itself. When adherent to the mesentery, as is so frequently the case, it is easy to see how the gut may be obstructed by pressure of the diverticulum acting as a band. The same is true when, by secondary adhesions, it becomes attached to the same intra-abdominal organ close to the posterior abdominal wall. An interesting illustration of the diverticulum acting as a band is a case reported by Dr. McArthur,²³ where the Meckel's diverticulum attached to the root of the mesentery, close to the ileocæcal valve, constricted the appendix, causing necrosis of the appendix and obstruction of the intestine.

Second. Obstruction from an adherent diverticulum may occur by a loop of gut passing under it and becoming twisted on itself, and thus forming a volvulus. A case is reported by McKenzie²⁴ where a loop of gut five feet in length had passed beneath an adherent diverticulum and become twisted and strangulated. Symmonds²⁵ also reports a case of volvulus occurring under a diverticulum of large size which was adherent. The point of attachment was not determined.

Third. Volvulus of the attached diverticulum itself occasionally occurs, and is the cause of obstruction of the intestine. Carwardine²⁶ reports a case of volvulus of a Meckel's diverticulum which caused the death of a child three days old. The operation being unsuccessful in relieving strangulation, post-mortem examination revealed a diverticulum filled with meconium and twisted upon itself. The intestine was occluded at the point of origin of the diverticulum.

Fourth. Strangulation over a tensely-drawn diverticular band may under certain conditions take place. Treves illustrates this mode of strangulation of the intestine by comparing it to a coil of soft rubber tubing thrown over a tightly-drawn wire and allowing it to become dependent. The weight of the tube will cause acute flexion and consequent obstruction of the ileum. Treves refers to a case of Lasseau where a diverticular band extending from the intestine to the umbilicus caused obstruction in this way. The symptoms developed very rapidly,

and death occurred in ten hours. The loop of intestine suspended from the diverticulum was necrotic.

Fifth. Occlusion by kinking due to traction happens much more frequently in attached diverticula than where the diverticulum is free. In most cases of this form of obstruction, the diverticulum is attached to the umbilicus. The intestine, by becoming over-distended either with fluids or gas, may so pull upon the anchored loop as to cause acute flexion and ultimate obstruction. Reignier,²⁷ experimenting with a loop of gut having a diverticulum seven centimetres in length, obtained from the body of an infant, found that, by gradually over-distending the gut with water, obstruction to the flow of water through the lumen occurred just below the diverticulum. In moderate distention, no obstruction was present. Obstruction from over-distention was due to the diverticulum becoming enormously dilated, and so pressing upon the gut just below as to produce acute flexion and, finally, complete obstruction.

Sixth. Obstruction from torsion of the diverticulum may occur when the diverticulum is attached, in the same way as when it hangs free. The same may be said of obstruction from chronic inflammation, or from congenital stenosis at the base of the diverticulum. Acute inflammation of the diverticulum—diverticulitis—may also act as a cause of obstruction in both attached and free diverticula.

Although in the majority of cases, when obstruction is caused by Meckel's diverticulum, the onset is sudden, yet in a few, chronic obstruction exists for a long time before the acute forms develop. This is particularly true where stenosis of the bowel above the diverticulum exists. Traction of the bowel at the point of attachment of the diverticulum also favors narrowing of the lumen at that point. This finally leads to chronic obstruction.

Prolapse of the small intestine through an umbilical faecal fistula is at times the cause of obstruction. Alsberge²⁸ refers to a case of Hüttenhemer, where at the end of the third month faecal fistula was established during an attack of whooping-

cough. The ileum prolapsed through the fistula, and death from obstruction followed. In the cases reviewed by the author, obstruction from prolapse of the intestine through an umbilical fistula, as well as those where obstruction from a Meckel's diverticulum was present in a hernial sac, have not been considered.

The importance of attempting in each case of obstruction to make a diagnosis of the variety of obstruction that exists, in order to facilitate intelligent operative treatment, cannot be overestimated. In any case of acute obstruction, the failure to determine with relative certainty the essential cause should not be considered a contraindication to prompt operative treatment, nor should such failure be used as an excuse for delaying the operation. Every case of obstruction is a case for operation. Of all forms of acute obstruction, none demand more energetic treatment than does that from a Meckel's diverticulum. In the great majority of cases the onset is sudden, and the symptoms are so characteristic of an acute obstruction that there can be no excuse for not offering prompt relief. It is true that only in a few cases, however, can we with any degree of certainty positively identify this form of obstruction before operation.

We have, as evidence of obstruction from a diverticulum, (1) The age of the patient; it usually occurs in children or in young adults; (2) the history of preceding minor attacks; (3) the configuration of the abdomen, which is that of an inverted cone; this being due to obstruction of the upper part of the intestinal tract. The absence of distention of the flanks is conspicuous during the early hours of the attack. (4) Local meteorism, especially upon the right side of the abdomen, under the costal arch, with in the early stage, in a few cases, visible peristalsis, prevails. (5) Fæcal vomiting, as a rule, comes on early; Cazin lays particular stress on its late appearance. The time when it appears depends, of course, upon the acuteness of the obstruction and the part of the gut strangulated. (6) Tenderness in the right side on a level, or just below the umbilicus. In looking over the cases reported in the

last ten years, one is impressed with the frequency with which this form of obstruction has been mistaken for appendicitis. This is unavoidable where the diverticulum forms a cyst and is lodged in the right side of the abdomen, as in Taylor's case. In McArthur's case, the diverticulum was not only the cause of obstruction of the bowel, but also constricted the appendix and produced gangrenous appendicitis. When the diverticulum is attached to the umbilicus, Berard²⁹ lays great stress on the exquisite sensitiveness of the umbilical region. (7) The coincident occurrence of other malformations, such as club-foot, harelip, exstrophy of the bladder, is mentioned by nearly all writers as of importance in the diagnosis of obstruction from Meckel's diverticulum. In sixty-nine cases reviewed by the author, harelip was present in one case; in no other was congenital malformation present. From this we may conclude that the absence of these deformities constitutes but slight evidence that the diverticulum does not exist.

Concerning the mortality of obstruction from Meckel's diverticulum, we have the statistics of Boldt,³⁰ fifty-five cases reported, fifteen operated upon with three recoveries. In a very comprehensive summary of this subject, Berard and Delore have tabulated thirty-two cases operated upon, with nine recoveries and twenty-three deaths, giving a mortality of about 72.3 per cent. Of the sixty-nine cases collected by the author, in sixty-six the termination is mentioned. Of these, forty-five died and twenty-one recovered, a mortality of 68.1 per cent. Of the sixty-nine cases, fifty-seven were operated upon, and of these the result is given in fifty-four, with twenty-two recoveries and thirty-two deaths, giving a mortality of 59 per cent. in the cases subjected to operative treatment.

No. 1.—*Operator*, Taylor: Johns Hopkins Bull., 1901. *Age and Sex*, six, female. *Character of Symptoms*, several minor attacks; last, very sudden onset of classical symptoms of acute obstruction. *Mode of Strangulation*, cystic free; diverticulum twisted three times at base; traction produced acute flexion at point of attachment of diverticulum. *Treatment*, diverticulum removed. *Termination*, recovery.

No. 2.—*Operator*, Morton: The Lancet, Vol. ii, 1900. *Age and Sex*,

nine, female. *Character of Symptoms*, symptoms similar to those of acute appendicitis. *Mode of Strangulation*, kink in loop of ileum, which was caught under a diverticulum that was attached to umbilicus and acted as a band. *Treatment*, diverticulum removed; no resection of intestine. *Termination*, recovery.

No. 3.—*Operator*, Hall: The Lancet (London), Vol. i, 1900. *Age and Sex*, three, male. *Character of Symptoms*, symptoms of obstruction lasting for four days; vomiting occasionally; abdominal distention; some pain; collapse on fourth day. *Mode of Strangulation*, diverticulum attached to mesentery; constriction of loop of ileum under this band. *Treatment*, diverticulum removed. *Termination*(?).

No. 4.—*Operator*, Hall: The Lancet (London), Vol. i, 1900. *Age and Sex*, five, male. *Character of Symptoms*, symptoms of acute obstruction by band. *Mode of Strangulation*, diverticulum attached to mesentery acted as band; loop of gut strangulated under this band. *Treatment*, diverticulum removed. *Termination*, recovery.

No. 5.—*Operator*, Sellers: The Lancet (London), 1900, Vol. i, p. 383. *Age and Sex*, thirty-two, male. *Character of Symptoms*, symptoms of acute obstruction; vomiting, pain, and abdominal distention of five days' duration. *Mode of Strangulation*, diverticulum attached by terminal ligament to umbilicus; loop of ileum compressed by diverticulum and obstructed. *Treatment*, laparotomy. *Termination*, death twelve hours after operation.

No. 6.—*Operator*, Fawcett: The Lancet (London), Vol. i, 1900, p. 1585. *Age and Sex*, eleven, female. *Character of Symptoms*, sudden onset of symptoms of acute obstruction; operation on third day. *Mode of Strangulation*, diverticulum one and a half inches long, with terminal ligament attached to "bowel;" coils of small intestine had slipped through ring thus formed. *Treatment*, laparotomy; diverticulum removed. *Termination*, recovery; no bowel resection.

No. 7.—*Operator*, Snow: Archives of Pædiatrics, 1900, Vol. xvii, p. 501. *Age and Sex*, three, male. *Character of Symptoms*, acute complete obstruction lasting four days; collapse. *Mode of Strangulation* (autopsy), diverticulum with ligament attached to mesentery close to ileocæcal valve; loop of ileum below diverticulum compressed by diverticulum acting as band. *Treatment*, no operation. *Termination*, death.

No. 8.—*Operator*, Mackay: The Lancet (London), 1900, p. 1068. *Sex*, young female. *Character of Symptoms*, complete obstruction; severe pain; fæcal vomiting; visible peristalsis; temperature normal. *Mode of Strangulation*, fibrous cord extending from ileum a short distance above ileocæcal valve to transverse mesocolon on left side; knuckle of small gut compressed under this band. *Treatment*, immediate laparotomy; cord divided. *Termination*, recovery.

No. 9.—*Operator*, Hohlbeck: Arch. für klin. Chir., Band lxi, 1900. *Age and Sex*, four and a half, male. *Character of Symptoms*, repeated attacks of pain and constipation; last attack accompanied by complete obstruction lasting four days; on fifth day gas and fæcal matter passed by bowels; tumor could be outlined at umbilicus. *Mode of Strangulation*,

diverticulum attached to omentum; twisted on itself; intestine occluded at point of origin of diverticulum; necrosis of gut at point of strangulation. *Treatment*, resection of twenty-seven centimetres of small intestine. *Termination*, death.

No. 10.—*Operator*, Hohlbeck: Arch. für klin. Chir., Band lxi, 1900. *Age and Sex*, thirty-nine, female. *Character of Symptoms*, complete obstruction lasting three days; abdominal distention, particularly on right side; faecal vomit. *Mode of Strangulation*, diverticulum twenty-three centimetres long; free at distal end; knotted about a loop of ileum; intestine gangrenous. *Treatment*, resection of eighty centimetres; union by Murphy's button. *Termination*, recovery.

No. 11.—*Operator*, Hohlbeck: Arch. für klin. Chir., Band lxi, 1900. *Age and Sex*, eighteen, ?. *Character of Symptoms*, sudden attack of severe abdominal pain; faecal vomiting, early; operation on second day. *Mode of Strangulation*, inversion of mucous membrane of Meckel's diverticulum; invagination of six inches of ileum. *Treatment*, invagination dislodged; diverticulum removed. *Termination*, death.

No. 12.—*Operator*, Robinson: British Medical Journal, 1899, Vol. ii, p. 1416. *Age and Sex*, five, male. *Character of Symptoms*, acute pain referred to umbilicus; abdominal distention, with tumor in right side of abdomen; diagnosis, intussusception. *Mode of Strangulation*, inversion of diverticulum with invagination of ileum above diverticulum. *Treatment*, resection. *Termination*, death two hours after operation.

No. 13.—*Operator*, Symmonds: British Medical Journal, November 18, 1899. *Age and Sex*, ?, male. *Character of Symptoms*, pain; vomiting; abdominal distention with complete obstruction. *Mode of Strangulation*, "adherent diverticulum with gangrenous intestines." *Treatment*, laparotomy. *Termination*, death.

No. 14.—*Operator*, Symmonds: British Medical Journal, November 18, 1899. *Age and Sex*, twenty-six, male. *Character of Symptoms*, complete obstruction lasting five days. *Mode of Strangulation*, "gut folded around a very wide diverticulum." *Treatment*, laparotomy. *Termination*, death.

No. 15.—*Operator*, Schmidt: Deutsche Zeitschrift für klin. Chir., 1899. *Age and Sex*, fifteen, female. *Character of Symptoms*, chronic obstruction of four weeks' duration. *Mode of Strangulation*, diverticulum attached to umbilicus, producing obstruction by kinking from traction. *Treatment*, laparotomy. *Termination*, death.

No. 16.—*Operator*, Berard et Delore: Lyon Méd., 1899, Vol. i, p. 90. *Age and Sex*, twenty, male. *Character of Symptoms*, acute obstruction, with faecal vomiting and severe pain at umbilicus; diagnosis of internal hernia. *Mode of Strangulation*, diverticulum attached to umbilicus; obstruction of ileum and adhesion of loops. *Treatment*, laparotomy; diverticulum removed. *Termination*, recovery.

No. 17.—*Operator*, Malgagne et Blanc: Bull. de Soc. Anat. de Paris, 1899, p. 427. *Age and Sex*, ?, male. *Character of Symptoms*, at first, symptoms of subacute appendicitis; incomplete obstruction and low fever. *Mode of Strangulation*, symptoms of acute obstruction from rupture of

diverticulum and pressure of abscess on loop of gut. *Treatment*, laparotomy; removal of diverticulum and drainage of cavity. *Termination*(?).

No. 18.—*Operator*, Bell: Montreal Medical Journal, 1898. *Age and Sex*, sixteen, female. *Character of Symptoms*, acute abdominal pain and abdominal distention. *Mode of Strangulation*, diverticulum given off three feet above the ileocæcal valve with ligament attached to right of umbilicus; obstruction by kinking just above the ileocæcal valve. *Treatment*, laparotomy. *Termination*, recovery.

No. 19.—*Operator*, Nedivill: The Lancet (London), 1898, Vol. i, p. 1465. *Age and Sex*, sixteen, female. *Character of Symptoms*, abdominal pain; vomiting and constipation. *Mode of Strangulation*, cord-like band stretched across from umbilicus to right side of abdomen; loop of gut compressed under band. *Treatment*, laparotomy; division of band. *Termination*, recovery.

No. 20.—*Operator*, Küttner, Beiträge zur klin. Chir., Band xxi, 1898. *Age and Sex*, forty-nine, female. *Character of Symptoms*, classical symptoms of acute obstruction. *Mode of Strangulation*, cause not determined at operation; autopsy showed intussusception of diverticulum. *Treatment*, laparotomy; drainage of abdominal cavity. *Termination*, death.

No. 21.—*Operator*, Stubenrauch: Centralblatt für Chir., 1898, No. 26. *Age and Sex*, five and a half, female. *Character of Symptoms*, sudden abdominal point; rectal tenesmus; bloody stool; vomiting and collapse. *Mode of Strangulation*, intussusception of ileum, starting at point of origin of diverticulum. *Treatment*, abdominal section. *Termination*, death.

No. 22.—*Operator*, Carle et Chavet: Prov. Méd., 1898. *Character of Symptoms*, sudden onset; obstruction, acute pain, vomiting, etc. *Mode of Strangulation*, diverticulum twelve centimetres long attached to mesentery, completely encircling a loop of small intestine.

No. 23.—*Operator*, Guinard: Bull. et Mém. Soc. de Chir. de Paris, 1898. *Sex*, young boy. *Character of Symptoms*, acute obstruction, with severe abdominal pain lasting two days. *Mode of Strangulation*, diverticulum attached to mesorectum; loop of small intestine constricted by pressure from this band. *Treatment*, laparotomy; removal of diverticulum. *Termination*, recovery.

No. 24.—*Operator*, De Quervain: Centralblatt für Chir., 1898. *Age and Sex*, sixteen, male. *Character of Symptoms*, acute pain, fæcal vomiting; complete obstruction. *Mode of Strangulation*, invagination of diverticulum. *Treatment*, resection. *Termination*, death.

No. 25.—*Operator*, Kramer: Centralblatt für Chir., 1898. *Age and Sex*, eighteen, male. *Character of Symptoms*, sudden pain, vomiting, and complete obstruction; painful tumor found in ileocæcal region; visible peristalsis. *Mode of Strangulation*, pear-shaped diverticulum adherent to root of mesentery; small intestine strangulated by twisting at point of attachment. *Treatment*, laparotomy; removal of diverticulum. *Termination*, recovery.

No. 26.—*Operator*, Kramer: Centralblatt für Chir., 1898. *Age and Sex*, forty, male. *Character of Symptoms*, pain and tenderness of abdomen, with some dulness in right side, following kick of a horse; partial

obstruction. *Mode of Strangulation*, first operation; pus cavity opened; urgent symptoms relieved; fæcal fistula persisted. Second operation four months later; fistula found to lead to diverticulum, which was removed. *Treatment*, laparotomy. *Termination*, recovery.

No. 27.—*Operator*, Gildersleeve: *Medical News* (New York), 1898, Vol. lxii. *Age and Sex*, twenty-one, male. *Character of Symptoms*, acute sudden pain and vomiting; diagnosis of appendicitis; collapse. *Mode of Strangulation*, diverticulum with its terminal ligament formed complete ring, through which a loop of gut passed. *Treatment*, no operation. *Termination*, death.

No. 28.—*Operator*, Thompson: *ANNALS OF SURGERY*, 1898, Vol. xxvii. *Age and Sex*, twenty-nine, male. *Character of Symptoms*, sudden onset, some griping pains referred to umbilical region. *Mode of Strangulation*, diverticulum with terminal ligament attached to base of mesentery; strangulation of loop near ileocæcal valve under this band. *Treatment*, operation five days after onset. *Termination*, death.

No. 29.—*Operator*, Fox: *Transactions of the Pathological Society*, London, 1897-8. *Age and Sex*, five, male. *Character of Symptoms*, acute abdominal pain; nausea and vomiting; temperature of a pyæmic type. *Mode of Strangulation* (autopsy), child with cleft palate; "diverticulum wound around gut at point of attachment;" diverticulum ruptured; obstruction of the root of diverticulum. *Treatment*, no operation. *Termination*, death.

No. 30.—*Operator*, Gally et Jeannel: *Arch. Prov. de Chir.*, 1898. *Age and Sex*, forty-seven, male. *Character of Symptoms*, acute abdominal pains, vomiting, and obstruction. *Mode of Strangulation*, twisting of gut with acute flexion at point of origin of diverticulum. *Treatment*, laparotomy; resection of gangrenous intestine. *Termination*, death.

No. 31.—*Operator*, Ewald: *Berliner klin. Woch.*, 1897, No. 8. *Age and Sex*, forty-two, female. *Character of Symptoms*, recurrent attacks of partial obstruction; sudden onset; in last attack, with complete obstruction. *Mode of Strangulation* (autopsy), inflammatory stenosis above attachment of diverticulum; invagination of diverticulum; perforations of intestine. *Treatment*, no operation. *Termination*, death.

No. 32.—*Operator*, Heresco: *Bull. de la Soc. Anat. de Paris*, 1897, lxi. *Age and Sex*, ?, ?. *Character of Symptoms*, sudden violent pain; fæcal vomit; profuse perspiration. *Mode of Strangulation* (autopsy), diverticulum twenty-five centimetres long with ligament attached to mesentery; loop of ileum constricted under this band. *Treatment*, laparotomy; cause of obstruction not found at operation. *Termination*, death.

No. 33.—*Operator*, Kammerer: *ANNALS OF SURGERY*, Vol. xxvi. *Age and Sex*, twenty, male. *Character of Symptoms*, acute pain in right side of abdomen; vomiting; greater distention on right side than on left. *Mode of Strangulation*, diverticulum six inches above ileocæcal valve attached to mesentery; encircled a loop of ileum immediately above the diverticulum. *Treatment*, anastomosis with Murphy's button; no resection. *Termination*, death.

No. 34.—*Operator*, Kammerer: *ANNALS OF SURGERY*, Vol. xxvi.

Age and Sex, forty-four, male. *Character of Symptoms*, diarrhoea and abdominal pain for one year; terminating in attack of severe abdominal pain, referred to umbilical region. *Mode of Strangulation*, diverticulum attached to umbilicus; part of sigmoid flexure compressed between diverticulum and anterior abdominal wall. *Treatment*, three operations. *Termination*, recovery; with artificial anus.

No. 35.—*Operator*, Kammerer: *ANNALS OF SURGERY*, Vol. xxvi. *Age and Sex*, eighteen, female. *Character of Symptoms*, cramps, with constipation lasting three weeks; finally complete obstruction with faecal vomit, some pain, and marked peristalsis; no flatus. *Mode of Strangulation*, diverticulum with terminal ligament attached, but torn loose during operation; point of attachment not determined; gut strangulated under band; exact mechanism obstruction not determined. *Treatment*, operation; diverticulum not removed. *Termination*, recovery.

No. 36.—*Operator*, Jordan: *Berliner klin. Woch.*, 1896. *Age and Sex*, nineteen, male. *Character of Symptoms*, acute obstruction with pain lasting four days. *Mode of Strangulation*, diverticulum attached to umbilicus; obstruction by acute flexion at point of origin of diverticulum; intestine gangrenous. *Treatment*, laparotomy; lateral anastomosis. *Termination*, death.

No. 37.—*Operator*, Dugan: *Pædiatrics*, 1896, Vol. ii, p. 71. *Age and Sex*, eleven, male. *Character of Symptoms*, sudden onset, complete obstruction; diagnosis of appendicitis. *Mode of Strangulation*, twisting of base of diverticulum; constriction by twisting of gut at point of origin of diverticulum. *Treatment*, diverticulum excised; gut sutured. *Termination*, recovery.

No. 38.—*Operator*, Latz: *Medical Review*, 1895. *Age and Sex*, twelve, female. *Character of Symptoms*, acute abdominal pain; faecal vomiting; no flatus. *Mode of Strangulation*, diverticulum with terminal ligament attached to mesentery; underneath was a loop of gut that was strangulated. *Treatment*, operation. *Termination*, death.

No. 39.—*Operator*, Latz: *Medical Review*, 1895. *Age and Sex*, four, male. *Character of Symptoms*, sudden colicky pain; early faecal vomit; rapid pulse and high temperature. *Mode of Strangulation*, diverticulum with terminal ligament attached to mesentery (secondary); loop of gut constricted under band. *Treatment*, operation; gut sutured. *Termination*, recovery.

No. 40.—*Operator*, Broca: *Bull. Soc. de Anat. de Paris*, 1895. *Age and Sex*, seven weeks, male. *Character of Symptoms*, sudden onset of typical acute obstruction of intestine. *Mode of Strangulation*, diverticulum adherent to mesentery, forming band; small intestine strangulated under this band. *Treatment*, operation; gut released. *Termination*, death.

No. 41.—*Operator*, Elliott: *Boston Medical and Surgical Journal*, 1894. *Age and Sex*, thirty, male. *Character of Symptoms*, sudden onset of vomiting, chills, and severe pain; pulse, 160; diagnosis of acute appendicitis. *Mode of Strangulation*, diverticulum seven inches long, of size of ileum, attached to umbilicus; diverticulum twisted at point of attachment

to intestine. *Treatment*, laparotomy; diverticulum removed; intestine sutured. *Termination*, death.

No. 42.—*Operator*, Councilman: Boston Medical and Surgical Journal, 1894. *Character of Symptoms*, sudden onset; death in sixteen hours from acute obstruction. *Mode of Strangulation* (autopsy), diverticulum attached to mesentery, formed a ring which completely surrounded a loop of gangrenous intestine. *Treatment*, none mentioned. *Termination*, death.

No. 43.—*Operator*, Boyle: Arch. de Méd. et de Pharm. Militeres, 1894. *Character of Symptoms*, symptoms of obstruction developed gradually; not complete until ninth day. *Mode of Strangulation*, diverticulum attached to umbilicus; loop of small intestine constricted under tensely drawn band. *Treatment*, operation; constriction removed. *Termination*, death.

No. 44.—*Operator*, Cazin: Soc. de Anat. de Paris, 1893. *Age and Sex*, eleven, male. *Character of Symptoms*, acute onset. *Mode of Strangulation*, unattached diverticulum snared a loop of small intestine. *Treatment*, resection of diverticulum. *Termination*, death.

No. 45.—*Operator*, Makins: British Medical Journal, 1893, Vol. i, p. 147. *Character of Symptoms*, acute obstruction of the intestine. *Mode of Strangulation*, diverticulum twisted, gangrenous, perforated. *Treatment*, operation. *Termination*, death.

No. 46.—*Operator*, Ochsner, A. J.: Journal of the American Medical Association, July 29, 1893. *Age and Sex*, eighty-one, male. *Character of Symptoms*, sudden onset of symptoms of acute obstruction. *Mode of Strangulation*, diverticulum with ligament attached to mesentery, formed loop through which small intestine had become strangulated. *Treatment*, loop disengaged; no resection. *Termination*, death.

No. 47.—*Operator*, Prince: Medical News (Philadelphia), 1893. *Age and Sex*, four, female. *Character of Symptoms*, acute onset complete obstruction lasting six days. *Mode of Strangulation*, diverticulum with ligament one inch in length, attached to mesentery, forming ring; loop of small intestine strangulated in ring. *Treatment*, resection; end-to-end union with Murphy's button. *Termination*, death.

No. 48.—*Operator*, Oderfeld: Gaz. Sekarska, January, 1892. *Character of Symptoms*, acute obstruction; diagnosis of obstruction by Meckel's diverticulum. *Mode of Strangulation*, diverticulum attached to mesentery, forming loop; knuckle of small intestine caught in loop and strangulated. *Treatment*, laparotomy; diverticulum removed. *Termination*, recovery.

No. 49.—*Operator*, Zurnrinkle: Arch. für klin. Chir., Band xl, 1892. *Age and Sex*, nineteen, male. *Character of Symptoms*, acute onset of obstruction lasting two and a half days. *Mode of Strangulation*, diverticulum with ligament ninety-five centimetres above ileocaecal valve; ligament attached to mesentery forming ring; loop of gut caught under ligament. *Treatment*, laparotomy; removal of diverticulum. *Termination*, death ten hours after operation.

No. 50.—*Operator*, Allen: Medical News, 1892, Vol. lxi. *Age and Sex*, thirty-four, male. *Character of Symptoms*, sudden onset, complete obstruction. *Mode of Strangulation*, diverticulum four inches long, from

region of cæcum to the abdominal wall near umbilicus; intestine twisted about this band. *Treatment*, laparotomy. *Termination*(?).

No. 51.—*Operator*, Adams: St. Bartholomew's Hospital Reports, 1891. *Age and Sex*, forty-two, male. *Character of Symptoms*, obscure, rather chronic; evidence of obstruction lasting two weeks. *Mode of Strangulation* (autopsy), invagination of diverticulum and ileocolic intussusception. *Treatment*, no operation. *Termination*, death.

No. 52.—*Operator*, Adams: St. Bartholomew's Hospital Reports, 1891. *Age and Sex*, ?, male. *Character of Symptoms*, no clinical history. *Mode of Strangulation* (autopsy), intussusception of diverticulum. *Termination*, death.

No. 53.—*Operator*, Mackenzie: Transactions of the Pathological Society, London, 1889-90, p. 127. *Age and Sex*, thirty-seven, male. *Character of Symptoms*, acute obstruction; vomiting; abdominal distention and pain. *Mode of Strangulation*, diverticulum attached to umbilicus; volvulus of five feet of ileum above origin of diverticulum. *Treatment*, no operation. *Termination*, death.

No. 54.—*Operator*, Chassevant: Bull. de la Soc. de Anat. de Paris, 1890. *Character of Symptoms*, classical symptoms of acute intestinal obstruction. *Mode of Strangulation* (autopsy), diverticulum fifty centimetres above ileocecal valve, attached to umbilicus; obstruction by torsion of diverticulum. *Treatment*, no operation. *Termination*, death.

No. 55.—*Operator*, Prendelsberge: Wiener klin. Woch., 1901. *Age and Sex*, fifty-one, male. *Character of Symptoms*, acute onset; vomiting; abdominal distention and severe pain. *Mode of Strangulation* (autopsy), unusually long diverticulum, which had become attached to mesentery; acted as band. *Treatment*, laparotomy; cause of obstruction not found at operation. *Termination*, death.

No. 56.—*Operator*, Taylor: British Medical Journal, 1901. *Age and Sex*, twenty-two, male. *Character of Symptoms*, symptoms of acute ileus. *Mode of Strangulation*, diverticulum given off one inch above ileocecal valve; terminal ligament adherent to small intestine about one and a half feet above origin of diverticulum; intestine constricted under band. *Treatment*, laparotomy; strangulated loop withdrawn. *Termination*, death.

No. 57.—*Operator*, Campbell: British Medical Journal, 1901, Vol. i, p. 1263. *Age and Sex*, seventy-one, male. *Character of Symptoms*, acute obstruction; death on third day. *Mode of Strangulation* (autopsy), "diverticulum had established a pathological relationship, but had no normal attachment of distal end;" acted as band. *Treatment*, no operation. *Termination*, death.

No. 58.—*Operator*, Walzberge: Verhand. deutsche Gesellschaft für Chir., 1898. *Age and Sex*, twenty-five, male. *Character of Symptoms*, those of acute ileus, lasting three days. *Mode of Strangulation*, diverticulum free; both ends obliterated; obstruction from kinking of intestine at point of origin of diverticulum; diverticulum formed cyst; intestine necrotic. *Treatment*, diverticulum removed; necrotic patch in gut inverted. *Termination*, death.

No. 59.—*Operator*, Walzberge: *Verhand. deutsche Gesellschaft für Chir.*, 1898. *Age and Sex*, fourteen, male. *Character of Symptoms*, acute obstruction, lasting three days. *Mode of Strangulation* (autopsy), distended diverticulum attached to umbilicus; torsion of diverticulum with sharp twist in gut, at point of origin of diverticulum; intestine necrotic. *Treatment*, operation; artificial anus established; diverticulum not removed. *Termination*, death.

No. 60.—*Operator*, Mintz: *Deutsche Zeitschr. für Chir.*, Band xliii. *Age and Sex*, twenty-four, male. *Character of Symptoms*, acute ileus; great distention of upper zone of abdomen; tenderness near umbilicus; death on fifth day. *Mode of Strangulation*, diverticulum attached to mesentery, forming a ring; within this a loop of ileum was strangulated. *Treatment*, no operation. *Termination*, death.

No. 61.—*Operator*, Weill et Frankel: *Bull. de la Soc. de Anat. de Paris*, 1896. *Age and Sex*, four, female. *Character of Symptoms*, acute ileus, one day's duration. *Mode of Strangulation*, invagination of diverticulum and ileum. *Treatment*, resection of intestine; suture. *Termination*, death.

No. 62.—*Operator*, Williams, D. H., Chicago: Personal communication. *Age and Sex*, twenty-five, male. *Character of Symptoms*, acute ileus. *Mode of Strangulation*, diverticulum with ligament adherent to mesentery; strangulation under band. *Treatment*, laparotomy. *Termination*, death.

No. 63.—*Operator*, Morgan, W. E., Chicago: Personal communication. *Age and Sex*, thirty-eight, male. *Character of Symptoms*, acute ileus, complete obstruction. *Mode of Strangulation*, diverticulum with ligament attached to mesentery. *Treatment*, amputation of diverticulum. *Termination*, recovery.

No. 64.—*Operator*, McArthur, L. L., Chicago: Personal communication. *Age and Sex*, forty, male. *Character of Symptoms*, acute obstruction. *Mode of Strangulation*, diverticular cord, with ligament attached to mesentery and umbilicus, constricted appendix under tightly drawn band; gangrenous appendicitis and rupture with peritonitis. *Treatment*, operation; removed appendix and diverticulum. *Termination*, death.

No. 65.—*Operator*, Henrotin, F., Chicago: Personal communication. *Character of Symptoms*, acute ileus eight days after operation for appendicitis, excessive tympany, pain, vomiting, etc. *Mode of Strangulation*, diverticulum five and a half inches long, attached by inflammatory adhesions to exudate about stump of appendix; small intestine twisted and obstructed. *Treatment*, operation; strangulation relieved. *Termination*, Recovery.

No. 66.—*Operator*, Davison, Chas., Chicago: Personal communication. *Age and Sex*, seven, male. *Character of Symptoms*, acute obstruction; subnormal temperature; tympany; collapse on fourth day. *Mode of Strangulation*, diverticulum two and a half feet from cæcum; terminal ligature apparently attached to another loop of small intestine. *Treatment*, operation; strangulation relieved. *Termination*, death.

No. 67.—*Operator*, Bevan, A. D., Chicago: Personal communication.

Age and Sex, thirty-five, male. *Character of Symptoms*, sudden onset; complete obstruction. *Mode of Strangulation*, diverticulum with ligament attached to umbilicus; acted as band. *Treatment*, removed diverticulum. *Termination*, recovery.

No. 68.—*Operator*, Bevan, A. D., Chicago: Personal communication. *Age and Sex*, twenty-two, female. *Character of Symptoms*, acute ileus. *Mode of Strangulation*, diverticulum with ligament formed loop. *Treatment*, operation; diverticulum removed. *Termination*, recovered.

No. 69.—*Operator*, Halstead, A. E., August, 1901. (Not reported.) *Age and Sex*, twenty-six, male. *Character of Symptoms*, several previous attacks; sudden onset; vomiting, pain, and abdominal distention; no flatus. *Mode of Strangulation*, diverticulum one and a half inches, with ligament two and a half inches, attached to mesentery forming ring; ileum constricted by this ring. *Treatment*, laparotomy; removal of diverticulum. *Termination*, recovery.

SUMMARY.

Number of cases reviewed	69
Males, 44; females, 16. (Sex recorded)	60
Result noted in	66
Deaths	45
Recoveries	21
Percentage of mortality	68.1
Cases operated upon	57
Result in cases operated upon mentioned in	54
Death in cases operated upon	32
No operation in	12
Percentages of death in cases operated.....	59.1
Attachment or non-attachment of diverticulum or diverticular ligament recorded in	63
Not mentioned	6
Attached	48
Free	15
To mesentery in	23
To umbilicus in	15
Not determined in	3
To mesocolon in	1
To mesorectum	1
To small intestine	3
To omentum	1
To peri-appendicular exudate	1

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- ⁵ Fitz: American Journal of the Medical Sciences, 1884.
- ⁶ Kammerer: ANNALS OF SURGERY, 1897.
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- ⁸ Boldt: Cited by Kammerer, ANNALS OF SURGERY, 1897.
- ⁹ Kelynack: British Medical Journal, 1897.
- ¹⁰ Leichtersterne: Ziemsen's Handbuch der Speciellen Pathologie und Therapie.
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- ¹³ Brinton: Cited by Fitz.
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- ¹⁵ Hohlbeck: Archiv für klinische Chirurgie, Band lxi.
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- ¹⁸ Taylor: Johns Hopkins Hospital Bulletin, 1901.
- ¹⁹ Küttner: Beiträge zur klinischen Chirurgie, Band xxi.
- ²⁰ Stubenrauch: Centralblatt für Chirurgie, 1898.
- ²¹ De Quervain: Centralblatt für Chirurgie, 1898.
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- ²³ McArthur: Personal.
- ²⁴ McKenzie: Transactions of the London Pathological Society, 1889-90.
- ²⁵ Symmonds: British Medical Journal, November 18, 1899.
- ²⁶ Carwardine: British Medical Journal, December 4, 1897.
- ²⁷ Reignier: Bull. de la Soc. Anat., Paris, 1879.
- ²⁸ Alsberge: Archiv für klinische Chirurgie, Band xxviii, 765.
- ²⁹ Berard et Delore: Rev. de Chir., 1899, 745.
- ³⁰ Boldt: König Specielle Chirurgie, 1900.

MECKEL'S DIVERTICULUM PATENT AT THE NAVEL.

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It is by no means rare to find at autopsy a Meckel's diverticulum. The percentage varies, according to different writers, from one to three. It is more rare for a Meckel's diverticulum to cause trouble; still more uncommon is it to find the diverticulum patent at the navel. As this last is a very serious condition, from which the infant seldom recovers, I consider it worth while to collect the literature of the cured cases and to add one to the list.

Meckel's diverticulum is formed by the persistence of the vitelline or omphalomesenteric duct or yolk stalk, synonymous terms. This duct connects the yolk sac with what is to form later the small intestine, some distance above the cæcum. At first it is a duct of large calibre, but gradually it becomes smaller and smaller as the embryo grows, and normally disappears by the sixth month, though after that it may still for a while be distinguishable microscopically as a shrunken remnant in the midst of the connective-tissue cells of the cord.

The patency at birth is ordinarily not discovered till the cord falls, when a fistula is left at the navel. The umbilical cord usually is of normal appearance and size, and causes no suspicion of anything wrong. Other congenital abnormalities—harelip, palate, etc.—are at times, though apparently very rarely, present, and in adult cases of vague abdominal symptoms are considered suggestive of the presence of the diver-

ticulum. The diverticulum may be so short that the ileum practically empties its contents at the navel, or it may be of considerable length.

A simple patent Meckel's diverticulum is an intestinal fistula opening at the navel. The mucous membrane lining the diverticulum is adherent to the umbilical ring. More or less of the intestinal contents may be discharged here, depend-



FIG. 1.

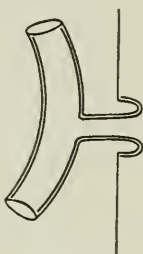


FIG. 2.



FIG. 3.

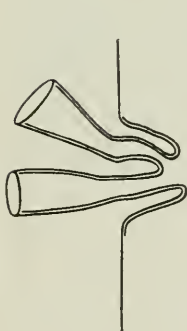


FIG. 4.

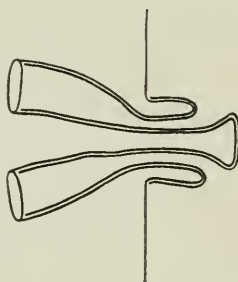


FIG. 5.

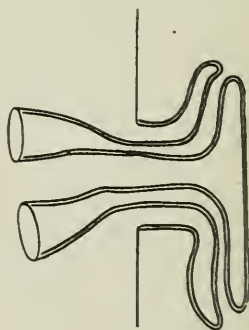


FIG. 6.

FIGS. 1 to 6 show the steps from a simple condition where the diverticulum is patent to the complicated form where the intestine is pulled out through the diverticulum.

ing on the size of the opening. If the opening is of fair size, the diverticulum may soon begin to protrude a little. Two reasons for this have been given by different writers,—the pressure in the abdominal cavity and peristalsis. This makes a small tumor at the navel covered with mucous membrane, with an opening at its apex. If the opening is very small, the

tumor resembles closely an ordinary umbilical polyp. The presence of pyloric and Lieberkuhn's glands in umbilical polyps shows that in many cases they are really due to the remains of

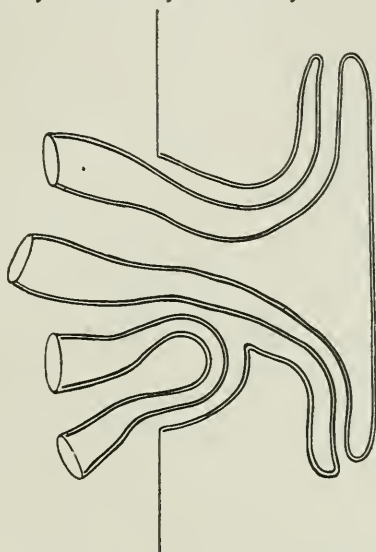


FIG. 7.—Prolapse of intestine between diverticulum and edge of ring.



FIG. 8.—Intussusception through Meckel's diverticulum.

a diverticulum which has closed everywhere except at the outside. The practical point about this is in regard to the treatment. We ordinarily snip or tie off an umbilical polyp with no

concern. However, it is well to look at them carefully hereafter, as the result of opening a diverticulum might be disastrous in the extreme. Lowenstein cut off what appeared to be a simple polyp. The removal of the polyp was followed immediately by a prolapse of intestine at the navel. Barth has said that a more careful examination of these apparently ordinary polyps will show an opening in many more than we expect. If the opening at the navel through which the prolapse comes is of sufficient size, the protrusion continues to increase and the intestine to be drawn nearer and nearer to the abdominal wall. Finally, the posterior wall of the protruding bit of intestine projects as a spur, exactly as occurs occasionally in an artificial anus. Guthrie reports a fatal case where this spur was so firmly wedged into the umbilical ring that no fæces could pass below into the lower intestine, which became atrophied. Until the appearance of the spur, there has been but one opening in the middle of the tumor; now, however, as the spur forces its way out, it divides this and forms two openings, one leading into the afferent piece of intestine and the other into the efferent. The spur may be so large that it pulls the intestine out through the ring. It becomes flattened and hides the openings which lie just under its overhanging edge. Further complications may occur from a knuckle of intestine prolapsing at one side between the diverticulum and the edge of the ring. When this occurs in a case where there is already a large protrusion of intestine, it makes a very complicated situation. Barth reports such a case. Golding-Bird reports even a more complicated one, where an intussusception had formed through the diverticulum. This necessarily makes three openings in the tumor,—two for the diverticulum formed by the intussusception dividing the original one, and one in the middle for the opening of the intussuscepted gut.

Diagnosis.—The essentials for a diagnosis are a fistula at the navel discharging fæcal matter with the mucous membrane firmly attached to the umbilical ring. The history is of importance in distinguishing an open Meckel's diverticulum from a fistula at the navel as the result of an abscess at that

point. It is to be distinguished from an umbilical hernia so large that it was caught in the ligature about the cord and was left as a fistula by the falling of the cord. Barth says that the diagnosis between these two is easy, though I think it might at times be difficult. An umbilical hernia caught in this way discharges all the fæces onto the abdominal wall, while an uncomplicated diverticulum ordinarily does not. The umbilical hernia also protrudes on coughing or straining, which a diverticulum is said not to do. At first, of course, the hernia is not attached to the umbilical ring, and its outside is covered by serous and not mucous membrane. If a child survives such a condition, the diagnosis later offers many difficulties, as the hernia then becomes adherent to the edges of the ring, and its surfaces covered so thickly with granulations that it is difficult to distinguish a serous from a mucous membrane. A patent diverticulum must also be differentiated from an open urachus. The direction taken by the probe in passing into the fistula and the character of the discharge are the distinguishing points. It may require a microscopic examination of the material which the eye of a catheter can pick up in the fistula to determine whether fæces are present or not, and of course on this hangs the diagnosis.

Treatment.—As soon as the diagnosis is made, compression should be applied, that an uncomplicated diverticulum may not begin to prolapse, and thus prevent, if possible, the chain of complications already mentioned. The treatment varies, of course, with the size of the fistula. Spontaneous cure is said to be rare. Barth gives in his article three cases which were cured by comparatively simple means. Marshall closed the fistula after freshening the edges, and then removed the tumor by the galvanocautery. Chandler cut off the tumor with scissors, and the wound healed without disturbance. Wernher cured temporarily his case by compression and cauterization. When the fistula is of any size, these procedures are inexact and may be dangerous, as shown by Lowenstein's case, already mentioned, where an intestinal prolapse followed the removal of what seemed a simple polyp, and the cicatrix

obtained by them is not so firm that a recurrence may not occur. To get a perfect view of the diverticulum and any complicating protrusions of intestine, a laparotomy is necessary. The case can then be dealt with rationally, the complications recognized and treated and the diverticulum removed, the opening into the intestine closed, and the edges of the abdominal ring freshened and sutured with a space for a wick or not, according to the judgment of the operator. This is a serious operation, and may be attended with profound shock.

Prognosis.—The prognosis depends on the severity of the case and the vigor, rather than the age, of the child. In the complicated cases it is most grave. Operation in these cases, however, seems to offer the only chance for cure. The mortality is large. In 1896, Kern could find but four cases (Broca, Gevaert, Stierlin, Shepherd) cured by laparotomy. By an examination of the literature since then, I have found four more cases, which, with the one I have to add, make nine cures in all.

I will simply mention the cases collected by Kern: Broca operated on a child six months old; Gevaert on one two and a half years old; Stierlin on one at two months, and Shepherd at three months.

To these I can add four cases from the published literature.

(1) Broca (Prolapsus Umbil., Bureau). Male, six months. At umbilicus a small red tumor with central orifice, into which a probe can be passed for some distance. Mucous membrane around the orifice directly continuous with skin of umbilicus. Operation. Diverticulum resected. Abdominal wall closed. Recovery.

(2) Broca (Prolapsus Umbil., Bureau). Male, ten months. At centre of umbilicus small red tumor composed of mucous membrane of everted diverticulum. At summit an orifice. Operation. Resection of diverticulum. Lateral suture of intestinal wall. Suture of abdominal wall. Recovery.

(3) Neurath (*Wiener klinische Wochenschrift*, 1896, No. 49). At centre of umbilicus red cone covered with mucous mem-

brane. Fistula in summit, into which probe passes eight centimetres. Tumor increased in size by crying or pressure. Never any fæcal discharge. Operation when three weeks old. Resection of diverticulum six centimetres long. Recovery.

(4) Briddon (ANNALS OF SURGERY, 1898, Vol. xxviii). When ten days old, baby began to pass fæces through unclosed umbilicus. After a few days all fæces discharged in this way. When three weeks old, admitted to hospital. At umbilicus an ovoid maroon-colored mass, size and shape of large hen's egg. On surface reduplications of valvulæ conniventes. Peristalsis visible. At apex an opening connecting with the lumen of the gut. About an inch in length close to the base of this larger mass and communicating with it a smaller one directed obliquely downward and to left. About size and shape of adult little finger. At its apex, also, an aperture communicating with the lumen of the gut operation showed that the prolapse was formed of the ileum projected through a diverticulum arising from that portion of the gut about a foot from its termination in the cæcum. Diverticulum about an inch in length. Neck of prolapse divided and artificial anus made. At a second operation this was closed and the diverticulum excised. Recovery.

The following came last May to the Out-patient Department of the Infants' Hospital, where I saw it.

No. 29,752. O. P. D., female, one month old. When baby was born, had a red mass projecting from navel about size of cord. When cord came off this was left. Bleeds all the time. Black discharge with bad odor. The case was referred to the House for operation, and I am indebted to Dr. John Dane for the following notes on the case.

Physical Examination.—Well developed and nourished except for malformation about umbilicus. Tumor one inch long and one-half inch wide protrudes from umbilical ring. Base constricted and gangrenous from attempts of parents to tie tumor off. One-half inch of apex covered by inflamed mucous membrane, which bleeds from many small areas all over surface. Centre occupied by a firm canal, which admits probe two inches. No discharge of fæces seen.

Operation.—Dr. John Dane. Ether. Vertical incision three

inches long in median line passing to left of umbilicus. Stump at umbilicus protected by moist gauze fastened to edges of wound. Some bleeding in abdominal wall requiring forceps pressure. Peritoneum opened and mesentery at once protruded. A diverticulum two millimetres long, one inch in circumference at base, three-eighths millimetre at apex found arising from free border of loop of small intestine and passing out through umbilical ring. Position of loop not ascertained. Loop drawn through abdominal wound. Peritoneal cavity walled off with gauze. Heavy clamp applied just inside umbilical ring. Intestine held on either side of diverticulum by digital pressure. Prolongation cut one-half millimetre from gut. Edges inverted and approximated by two rows Lembert sutures of fine silk. Umbilicus removed by a second vertical cut close to its base on right side. Skin and peritoneum rapidly sutured with interrupted silkworm gut. Gauze drain. Dry dressing. Considerable shock. Recovery.

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HERNIA OF MECKEL'S DIVERTICULUM.

By R. E. WEBSTER, C.M., M.D.,

OF OTTAWA,

GYNÆCOLOGIST TO THE COUNTY CARLETON GENERAL HOSPITAL, OTTAWA.

CASES of Meckel's diverticulum met with in the operating-room, whether free or attached to the abdominal parietes, are sufficiently rare to be always of interest to the surgeon. The following case, therefore, is put on record as a contribution to statistics.

Miss O'R., aged forty-two years, was admitted to hospital October 11, 1901, giving the following history: Three days before admission she fell down a cellar stairway, since when she has had severe abdominal pain and almost continuous vomiting. Bowels were moved by a purgative taken after the accident occurred.

On examination the abdomen was found to be greatly distended, and a large tender mass noticed in the left inguinal region occupying the inguinal canal. The patient states that she has frequently noticed a similar lump here, which was sometimes painful and which generally disappeared on lying down. Partial reduction of the hernia was easily accomplished by a member of the house staff, but a hard mass was still present in the inguinal canal. The bowels moved shortly afterwards, showing a good deal of blood in the stools. The symptoms of pain and distention somewhat abated, and the patient was prepared for operation. The patient being anæsthetized, the external ring was exposed and the inguinal canal opened up to the internal ring and the sac and contents carefully dissected out.

On opening the sac, a cylindrical mass looking like intestine was discovered, and on carefully opening the internal ring and separating the adhesions this was found to be a Meckel's diverticulum proceeding from close to the mesenteric border of the

ileum, having a well-defined mesentery of its own. The mesentery was tied off and the diverticulum removed close to the ileum, and the opening in the bowel, which was of sufficient calibre to admit the tip of a finger, closed by a double row of Lembert sutures.

The diverticulum measured three and a half inches in length. The intestinal lumen was continuous for about three inches, the diverticulum ending in a mass showing some old inflammatory thickening. There was a good deal of inflammatory thickening of the ileum surrounding the diverticulum, showing where that portion had been constricted in the inguinal ring. The operation was completed by suturing the rings for a radical cure of the hernia. The patient made an uninterrupted recovery.

BONE CYSTS.

A CASE IN WHICH THE HUMERUS WAS INVOLVED, WITH THE
X-RAY AND MICROSCOPIC FINDINGS.

By EUGENE R. CORSON, M.D.,

OF SAVANNAH, GA.,

THE following case seems of sufficient interest to warrant its publication:

Miss V. H., aged twenty-one years, had enjoyed good health up to her fifteenth year, when she had an attack of typhoid fever lasting six weeks. Two years later, in 1897, she began having pain in her right arm, and was treated for rheumatism. In 1898, while being helped from a train her right humerus was broken about the junction of the middle and lower thirds, at a point where she had previously suffered the most pain. That such a slight force should have fractured the bone was easily explained when we found later the cyst in the humerus and the advanced bone atrophy. This fracture was diagnosed and set under an anæsthetic. She recovered from this injury, but the pain in the arm continued, and in the summer of 1899 this pain had become so severe that she came to Savannah and entered the Telfair Hospital, in the service of Dr. T. P. Waring. The patient being thin, the enlarged and sensitive lower half of the humerus could be easily felt. There was no fever.

A skiagraph was taken, but it did not settle the diagnosis. Of course, the exact extent of the enlargement was definitely ascertained, and we could see where the fracture had probably occurred. That the bone itself was seriously involved was also very evident. A provisional diagnosis of osteomyelitis was made.

I operated during the absence of Dr. Waring from the city. A postero-external incision was made over the point of greatest enlargement. The thickened periosteum was so adherent to the

bone as to render its separation difficult. The thin shell of bone was evident on its indenting on the least pressure. With a pair of scissors a window was cut in the bone and about an ounce and a half of a clear brownish fluid escaped, of the consistency of synovial fluid. The finger introduced into the cavity showed an elliptical space about eight centimetres long and three centimetres wide, lined by a smooth membrane having the feel of a mucous membrane. The shell of bone at this point was not over four millimetres thick. The cavity was not curetted, but simply packed with ten per cent. iodoform gauze wrung out of corrosive sublimate solution 1 to 4000. The patient left the hospital one month later with the cavity still discharging, though much reduced in size. The pain disappeared. The patient married shortly afterwards, and at the present writing, two years after the operation, I hear she has gained in flesh and has good use of her arm, though there is still a small sinus with a slight discharge.

The skiagraph, viewed in the light of the clinical symptoms and the operation, shows us the following conditions present. The lower half of the bone is involved in a spindle-shaped swelling. The upper half of this enlargement shows a much lighter shadow and indicates the position of the cyst as found by operation. In a second figure I have indicated approximately the size and position of this cyst. The lower third of the humerus shows no medullary canal, but there is a mottling of the shadow which indicates that the thickness of the bone varies. This mottling is also seen over the cyst area and has the same significance. This lower third of the bone was not directly reached by the operation, though there was evident marked involvement of the bony tissue, probably areas of softened or atrophied bone. At the point of greatest swelling a roughened portion may show the site of the fracture, which was evidently subperiosteal. I regret I have no skiagraph of the entire humerus to compare healthy with diseased portions. This skiagraph bears some resemblance to one given in Von Eiselberg and Ludloff's Atlas,¹ of a case of osteomyelitis of the humerus and olecranon.

The piece of cyst wall removed was decalcified, sectioned, and stained with hæmatoxylin and eosin by my friend, Professor S. H. Gage, of Cornell University. The microscopic findings are

¹ Atlas klinisch wichtiger Röntgen-Photogramme, herausgegeben von Professor Freiherr von Eiselberg und K. Ludloff. Berlin, 1900, Plate XX.



FIG. 1.

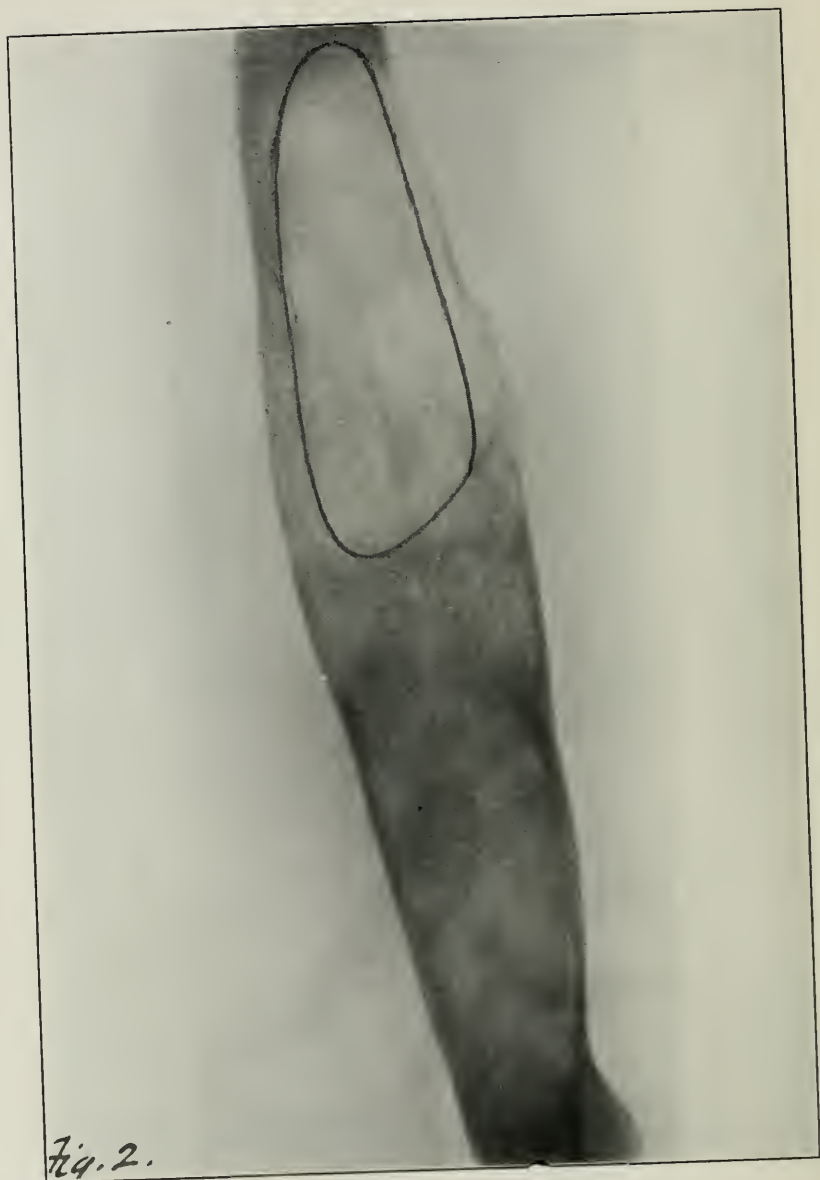


FIG. 2.

interesting. I present a drawing of the section under a C eye-piece and a three-fourths objective (Bausch and Lomb). There is a well-organized lining membrane to the cyst wall resembling somewhat a synovial membrane. There is no evidence of any mucous tissue. The narrow layer of bone, with its thin bony trabeculæ, its numerous cancellous spaces, and Howship's lacunæ show in a striking way the advanced atrophy. This atrophy has taken place largely from the cyst side, as shown by a layer of fibrous tissue between the disappearing bone and the lining membrane of the cyst. This fibrous tissue, in places rich in cells undergoing degeneration, represents the ultimate transformation of the bone. In some places the transition from bone to fibrous tissue is beautifully shown. There are no osteoclasts, and the active process of atrophy has probably long ceased. We see but the ruins of the fire. The periosteum has degenerated; it has a granular appearance containing but few cells, and there is no inner osteoplastic layer. In a few places, not shown in the drawing, some muscular fibres, which still adhered to the periosteum, have been cut across. There is no sign of any heterologous tissue or any new growth pointing to malignancy. We see simply the result of an old ostitis largely overcome by the vital resistance of the patient, but at the expense of great bone atrophy and impaired function.

Bone cysts are not common, and I find but scant literature on the subject, with little definitely known of their origin and pathology. The text-books barely mention the subject, and the periodical literature demands careful search to find the few reported cases.

Billroth,¹ in 1884, brought up the subject before the Medical Society of Vienna. He compared these cysts with the normal cavities in the skull and with dentigerous cysts. He had little to offer as to their pathology or clinical history.

In the *Revue de Chirurgie* ² for 1895 Nové-Josserand and

¹ Wiener medicinische Blätter, 1884, vii, p. 238. See also Bostrum. Sitzungsab. der Phys.-med. Soc. zu Erlang., 1879-80, xii, p. 168; and Festsch. der Versamml. deutsche Naturf. und Aerzte. Freib. in B. und Tübingen, 1883, pp. 89-110.

² See a notice of this case in the Centralblatt für Allgemeine Pathologie und pathologische Anatomie, Band vii, No. 1, p. 100.

Bérard report a case of cystic myxoma of the tibia in a boy of sixteen. There was a swelling of the right tibia of three weeks' duration, without any special pain, and with the skin only slightly red. An operation showed a bone cyst covered by thickened periosteum three millimetres thick. The microscope showed the growth to be largely composed of mucous tissue, the cellular elements diminishing towards the cyst side, the innermost layers staining badly. This bony shell had the character of periosteal bone. There were no Haversian canals, and but a few irregular bone cells resembling fetal tissue; the isolated lacunæ of Howship were lined with osteoclasts, and between these islets of bone a stroma of mucous tissue; large nucleated cells with numerous fine branches; some myeloplques with few masses of round cells; but few blood-vessels with a single endothelial wall, the tissue gradually passing into true periosteum. The tumor was diagnosed as a pure neoplasm, a periosteal myxoma, of congenital origin. By its growth the osteogenic layer of the periosteum was excited to bone growth, the tumor proper being surrounded more and more by a bony shell.

Kehr¹ has reported a case of cyst of the upper end of the femur, "the size of an apple," treated by operation, in a boy of six years. It was a smooth-walled bone-distending cyst containing a clear brown fluid. Two and a half years after the opening and curetting there was complete cure. Kehr does not commit himself as to the diagnosis, uncertain whether the cyst was of a fibrosarcomatous or simple inflammatory origin. The ultimate recovery of the case points, I think, to its being the result of inflammation only.

Sonnenburg² has reported a case of bone cyst of the left humerus, upper third, in a girl of twelve years. This was opened, curetted, and packed with iodoform gauze, with ultimate complete cure.

H. Schlange,³ of Berlin, has written more at length on

¹ *Centralblatt für Allgemeine Pathologie und pathologische Anatomie*, Band vii, p. 706.

² *Knochencyste des Oberarmes ohne nachweisbare Ursache*, *Deutsche Zeitschrift für Chirurgie*, 1879, Band xii, p. 314.

³ *Verhandlungen der deutschen Gesellschaft für Chirurgie*, Berlin, 1893, xxii, pt. 2, pp. 198-211. Also *Archiv für Chirurgie*, Berlin, 1893, xlvi, pp. 373-386. *Arb. a. d. chir. Klin. d. k. Univ.*, Berlin, 1893, viii, pp. 17-30. *Festschr. zur Feier. von Esmarch*, Kiel und Leipzig, 1892, pp. 429-442.



FIG. 3.—Section of cyst wall; hæmatoxylin and eosin stain; lining membrane of cyst on the left; remains of periosteum on the right. C eyepiece and three-quarters objective (Bausch and Lomb). Transformation of bone into fibrous tissue well shown towards the cyst side.

the subject and has reported several cases. They were treated by incision, curettage, and a packing of the cyst cavity with gauze. He treats of his cases from the clinical side, and has little to give us of the microscopic character of the lesion. He inclines to the view of its congenital origin.

A bone cyst must naturally be of rarer occurrence than cysts in the other tissues of the body, and as cysts in the soft tissues have different origins and represent different pathological processes, so evidently must bone cysts originate from very different conditions. Two of the cases I have quoted show us this in a striking way. Nové-Josserand and Bérard's case, diagnosed as cystic myxoma, was evidently a neoplasm and malignant, while the cases of Kehr and Sonnenburg were much like the present case, of simple inflammatory origin. Several of Schlange's were also of this nature. We can conceive of bone cysts resulting from trophic changes only, a cystic osteomalacia, or due to almost any condition of the blood or nerves affecting the nutrition of the bone. A purely congenital origin, as suggested by Billroth, Schlange, and others, is also a probable cause. The present case, so similar to Kehr's and Sonnenburg's, should be regarded as the most common form and the most typical. The cysts contain a clear brownish fluid, have a distinct lining membrane, and suggest practically the same surgical treatment, namely, curettage and gauze packing, to drain and stimulate the cyst wall to bone growth; to replace osteoclasts by osteoblasts. The present case was not curetted because of the thinness of the cyst wall, trusting to iodoform gauze and corrosive sublimate to stimulate the growth of the bone and fibrous tissue, for, even if the cyst cavity fills up with fibrous tissue alone, it may be regarded as a cure. Although, as the skiagraph shows, the lower third of the humerus was diseased, and was not directly reached by opening the cyst, it is probable, from the history of the case since the operation, that the degenerative changes in this portion of the bone have ceased, and the tissues are gradually recovering their normal life.

An inflammation affecting a bone and its medullary canal

must be a form of osteomyelitis, but with typical bone cysts the clinical picture differs greatly from what is known as typical osteomyelitis. In the former the course of the disease is comparatively slow, with but moderate pain, and almost no systemic symptoms, while with the latter the course is much more rapid, the pain and local symptoms more pronounced, and the systemic symptoms almost equally pronounced. A study of the present case suggests the thought that the difference is more from the resistive power of the patient than from a difference in the nature of the germ or poison. In the typical osteomyelitis everything tends to give way; in the bone cysts, the inflammatory action has been largely overcome, and the bone atrophy and the cyst are but the ruins of the conflagration. The system has conquered, but at the expense of much loss of tissue and impaired function. Whether in this case the starting-point of the inflammation was the direct result of the typhoid fever, it is impossible to state definitely. To my mind there is a strong probability of this relationship in this case, and Dr. Waring concurs with us in this conclusion. Cases have been reported of bone troubles following typhoid fever, and where the typhoid bacillus has been found in the pus. In the *Deutsche medicinische Wochenschrift* for August, 1901, Ernst Unger contributes a paper on post-typhoidal bone suppuration. He reports the following:

A young man had typhoid fever from August to October, 1900. In February, 1901, a swelling appeared below the right olecranon, and another swelling near the head of the right radius. An incision into the larger swelling showed carious bone, and the typhoid bacillus was found in the pus. The interesting points are the situations of the suppurations, the two swellings, and the spontaneous resolutions of the smaller one, and that there was no Widal reaction during the suppurative process.

In the same journal last year Conradi made a similar observation.¹ Valuable as the X-ray is in all these bone troubles, it cannot diagnose for us the real and ultimate con-

¹ Excerpt in the Philadelphia Medical Journal, November 23, 1901.

ditions present. It could not differentiate between a bone cyst proper and a portion of bone softened down to a pultaceous mass, or to a collection of pus, as we see in some forms of osteomyelitis. We must remember that all the X-ray shows absolutely is differences in density, and we must draw our conclusions from shadows only. Its real value lies in showing the extent of the disease, and its point of greatest intensity, thus marking out for us the field of operation. Here, of course, it is priceless. We have just seen a case of knee trouble where the clinical symptoms pointed to the joint as the part involved, but where the X-ray pointed definitely to the lower end of the femur as the seat of the disease. The skiagraph could not tell us whether it was a cystic condition or softened bone, or what was the character of the inflammation. It did, however, show us that an immediate operation was called for, and it showed us the exact field of operation, which are the important considerations from a surgical stand-point.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, December 11, 1901.

The President, L. W. HOTCHKISS, M.D., in the Chair.

GRAVES'S DISEASE TREATED BY LIGATION OF ALL FOUR THYROID ARTERIES.

DR. ROBERT H. M. DAWBARN presented a young woman, twenty-four years old, who had suffered from Graves's disease for eight years, and had been subjected to every form of medicinal treatment without much benefit. When she was brought to Dr. Dawbarn by Dr. Howell, of Newburgh, New York, she presented every one of the well-known symptoms of this disease, especially tachycardia, an enlarged thyroid, exophthalmos, cerebral excitement, tremor, etc. The goitre itself was not very large, but, on account of the tenseness of the cervical fascia covering it, the tumor exerted pressure on the trachea, and when especially congested it caused mechanical obstruction to respiration. It was for the purpose of relieving these attacks, which were paroxysmal in character, that an operation was done eight weeks ago. After due consideration, it was decided not to extirpate the goitre. If this is done on one side only, it leaves asymmetry; and if both sides are extirpated, Dr. Starr has shown that in twenty-three of the 190 cases collected by him death resulted, immediately after operation, accompanied by extremely high temperatures, apparently due to handling the thyroid body. Then, too, there would be the subsequent risk of cachexia strumipriva. It was considered safer to tie all four thyroid arteries, and this was accordingly done. The wound closed by primary union and the dressings were removed on the fifth day. The neck, which was seventeen inches in circumference before the operation, decreased to fourteen in less than ten days. The patient still has some

tachycardia and tremor, though less, but the exophthalmos and all her symptoms have distinctly improved. There has also been a reduction in the continuous slightly elevated temperature, which is quite characteristic of certain cases of Graves's disease. At the time of her operation it had been 101° F.; now it is a fraction of one degree above normal.

Dr. Dawbarn said that, in addition to the operation, the patient has been placed upon the dietary treatment which has been so strongly advocated by Dr. William H. Thomson, that is, the avoidance of highly nitrogenous food, especially meats, and the use of milk in various forms, and stale bread, combined with the persistent administration of some intestinal antiseptic, such as phenol bismuth, and an occasional mercurial purge. Dr. Thomson claims that meat is as injurious to a patient with exophthalmic goitre as sugar is to a diabetic; and that this dietary, to effect a permanent cure, must be continued for about two years.

Dr. Dawbarn said that in a second case of Graves's disease where he had ligated the four thyroid arteries in the City Hospital, one month ago, the symptoms were almost an exact counterpart of those complained of in the case just presented, and the operation was done for the same urgent reason; namely, to relieve the pressure symptoms on the trachea. In that case the patient, a middle-aged American woman, was partially idiotic, possibly presenting a form of cretinism. Primary union followed. The results of the operation were just as satisfactory as in the case shown. This second patient, as also the young woman just shown to the Surgical Society, were exhibited at a recent meeting of the New York Polyclinic Medical Society.

In both patients the operator had assumed that, partly from a possible *arteria thyroidea ima*, partly by small anastomoses from the external carotid and subclavian systems, enough blood would reach the thyroid to prevent gangrene from anemia; and this proved true.

The thyropexie of Jaboulay Dr. Dawbarn did not consider an operation based upon good surgical principles, and believes it has little standing among American surgeons.

DR. F. KAMMERER said that about ten years ago, when Ryd-gier first published the result of his experience with ligation of the four thyroid arteries, which he advocated especially for Graves's disease, he (Dr. Kammerer) resorted to that method in

a case which resulted fatally. The patient died within twelve hours after the operation, showing the symptoms that have been usually described as present in these cases, *i.e.*, acceleration of pulse,—ranging as high as 200 and over,—cyanosis, and high temperature. These symptoms failed to improve under various methods of treatment.

Dr. Kammerer said he thought that cases like these operated on by Dr. Dawbarn, where the operation was undertaken for the purpose of relieving pressure symptoms, should be distinguished from those where the operation is undertaken purely and simply for the relief of the usual symptoms of Graves's disease. The speaker said that in his case, which was operated on fully ten years ago, before we knew as much about the cause of Graves's disease as we do now, a very thorough post-mortem examination failed to reveal any explanation for the fatal outcome, which even then led him to suspect, with others, that there must be a difference in the nature of the cases of so-called Graves's disease, and that all of them could not be classed under one head. Since then, the speaker said, he has performed the operation in three further cases, and of the four only one survived the operation. In justice to the question under discussion and to himself, he would say that the operative technique in the cases mentioned had not been very difficult, and that his personal experience with operations upon the thyroid gland was not so very small. In one of the cases, it is true, the recurrent laryngeal nerve had been cut on one side during partial removal of the gland, but this mishap does not, as has been shown, determine a fatal issue.

Dr. Kammerer said that only recently Ehrich had called attention to the fact that we should exercise great care as regards the proclamation of the final result of operative interference in Graves's disease. Ehrich admits that some of the cases which he himself pronounced cured or very much improved have not sustained the earlier opinion of success. A subsequent and more careful observation compelled the writer to say that in a great many of his cases the lasting benefit of the operation was very slight indeed.

INFERIOR BLEPHAROPLASTY.

DR. DAWBARN presented a man, seventy years old, who was operated on by him five years ago for an epithelioma of the left

lower eyelid. The entire eyelid was removed, and a new lid provided by the following plastic operation, which the speaker said he had never before seen described. A curved flap, about double the depth of the denuded area (in order to allow for shrinkage), was dissected from the cheek, directly underneath the eye, leaving an attachment at either end; and then its free upper edge was attached to the free edge of the upper lid by a few temporary silk stitches. Its lower free edge was sewn with finest chromic gut, upon its deep surface, to the periosteum of the lower edge of the orbit. Thus the new lid was made. The raising of this flap left a gap on the cheek, which was covered by a smaller flap of the same shape taken from the cheek below; and the gap thus left was in turn closed by a still smaller flap. In all, three curved incisions were made on the cheek, with their convexity downward, and lying directly above each other.

In order to form a proper sulcus between the eye and eyelid and prevent adhesions of the new flap to the eye, a piece of gutta-percha tissue was slipped underneath it, and changed at intervals, until the under surface of the new lid was healed.

The result of the operation, from both a practical and cosmetic stand-point, was excellent. Excepting for the absence of eyelashes, the fact that an operation was performed upon the lid, or cuts made upon the face, can with difficulty be detected.

Dr. Dawbarn had exhibited this patient before the eye section of the Academy, Dr. Gruening, chairman; and none of the eye surgeons present had known of this plan being used before, as regards the source of the flap.

COMPOUND DISLOCATION OF THE ELBOW.

DR. PERCY R. BOLTON presented a middle-aged man, who several months ago fell from a height of twenty or thirty feet, sustaining a compound backward dislocation of the right elbow. In addition to this injury, there was a fracture of the external condyle of the humerus. The dislocation was reduced, a counter-opening was made for drainage, and the arm was suspended at an angle of 125° . Practically no suppuration occurred, and the wound closed entirely in the course of three weeks. When the patient was discharged from the hospital, there was a slight degree of motion at the joint, which he has since increased by

massage and active movements, so that he now has practically a normal arm.

DR. L. A. STIMSON said he wished to emphasize the importance of vertical suspension in cases like that shown by Dr. Bolton. The speaker said that in a considerable number of cases of compound injuries involving the elbow-joint or lower end of the humerus he has been struck by the very mild reaction observed when that attitude is given to the limb. He had seen the severest injuries in this region heal kindly when that position was maintained for two weeks.

FRACTURE OF THE CARPAL SCAPHOID, WITH DISLOCATION FORWARD OF THE CENTRAL FRAGMENT.

DR. LEWIS A. STIMSON read a paper with the above title, for which see May No. ANNALS OF SURGERY.

DR. ALEXANDER B. JOHNSON, in connection with the cases presented by Dr. Stimson, showed an X-ray photograph of a fractured carpal scaphoid which came under his observation last spring. He first saw the patient about six weeks after the injury had been received. The case had been regarded and treated as one of Colles's fracture, but the X-ray showed a fracture through the narrow portion of the scaphoid. When Dr. Johnson saw the patient, there was almost complete immobility of the wrist, with considerable swelling. The patient disappeared after the photograph was taken.

DR. JOSEPH A. BLAKE showed an X-ray picture of a case of fracture of the carpal scaphoid and subluxation of the semilunar bone which he presented at one of the meetings last spring. In most of these cases, the speaker said, the fracture seems to occur through the same portion of the scaphoid. In his case, a young riding instructor who sustained the injury by falling from his horse, the nature of the injury was recognized at the time, but the patient would not submit to removal of the bone. The accident has left him with a wrist that is stiff and quite painful, and a resection of the fragment, and possibly the semilunar, will be necessary to obtain proper function.

DR. STIMSON said he had seen three cases of fracture of the scaphoid alone resulting in complete loss of mobility in the joint. This effect, the speaker said, can hardly be attributed solely to the

fracture itself, and must be due in part to associated derangements in other portions of the carpal joint. These injuries are usually produced, apparently, by avulsion in forced movements of the carpal bones. The fracture is usually through the narrow portion of the bone, although one or two cases are on record where the bone has been split longitudinally. It seems very unlikely that a simple, uncomplicated fracture of the scaphoid should result in such complete loss of motion as has been reported in many of these cases; and it is probable that the same injury which caused the fracture produced changes in the adjoining carpal bones, and in the repair of those injuries a loss of function results.

COMPLETE BONY ANKYLOSIS OF THE RIGHT TEMPOROMAXILLARY ARTICULATION.

DR. IRVING S. HAYNES presented a woman, twenty-seven years old, who had scarlet fever when she was seven years of age. This was followed by otitis media on the right side, and there has been a more or less constant discharge from that ear since. About the same time the right jaw began to stiffen, and in about seven years the ankylosis was complete. Since her fourteenth year she has been compelled to feed herself with liquid food inserted through the aperture left by a missing tooth.

When Dr. Haynes first saw the patient, about a month ago, there was absolute fixation of the jaw on the right side; on the left side there was very slight motion, perhaps one-sixteenth of an inch. The operation consisted of a transverse incision parallel to the zygoma and just below it until the masseter was reached. The bone was then exposed by separating the fibres of the muscle vertically, and the nature of the ankylosis determined. A great deal of new bone had formed about the joint, which had practically obliterated the neck of the inferior maxilla. A section was made through the ramus of the bone with gouge and chisel, and the ends of the lower fragment rounded off so that it would rotate against the horizontal surface of the fragment above. The wound was packed firmly with gauze in order to check the oozing, which was very free, and to keep the fragments separated. The incision was sutured as far as the gauze wick. Primary union followed in this portion of the incision, and the remainder closed within a few days after the gauze drain was removed.

The patient can now separate her jaws about an inch, and

she is able to chew solid food with only slight discomfort. The range of motion is slowly increasing. One or two conditions ought to be noted. First, the teeth are almost buried out of sight by the growth of the gums, which have had no opposition, such as is offered by the mastication of solid food. Second, the alveolar arches have caved in at the sides from the constant sucking efforts for thirteen or more years, so that both upper and lower teeth look inward, except the incisor teeth, which have been projected forward to compensate for the change in the alveolar arches.

DR. HOWARD LILIENTHAL suggested that perhaps it would have been better to do a double section of the zygoma, then turn it down with the masseter muscle, and gain access to the neck of the superior maxilla in that way, practically employing the same incision as in the Braun-Lossen operation for reaching the two lower divisions of the fifth nerve. By this method, perhaps, an indrawn cicatrix might be avoided and possible interference with the masseter muscle.

THORACIC INJURIES INVOLVING THE LUNG.

DR. W. G. LE BOUTILLIER read a paper with the above title, for which see May No. ANNALS OF SURGERY.

URETERAL CALCULUS REMOVED BY SUPRAPUBIC CYSTOTOMY.

DR. LEWIS A. STIMSON presented a woman who entered the medical side of the New York Hospital complaining of severe pain in the lower part of the abdomen. On examination by the vagina a lump could be felt on the roof of the vagina, which clearly appeared to be a calculus embedded in the left ureter.

The patient was transferred to the surgical side of the hospital, where Dr. Stimson opened the bladder above the pubes by a longitudinal incision, and sought to express the stone by means of one finger inserted in the vagina and another in the bladder. This method failing, he enlarged the opening in the bladder, elevated the floor of that organ by means of a tenaculum, and then passed a dissector into the ureteral orifice, enlarged the latter with scissors, and removed the stone in three fragments. The bladder and external wounds were closed immediately, and the patient made an uneventful recovery, without any leakage. The stone is small and slender, and apparently was branched.

URETERAL CALCULUS.

DR. FORBES HAWKES exhibited a calculus removed from the ureter of a woman, thirty-three years old, whose first symptoms of renal trouble dated back about three years. She then had some pain and hæmaturia, and subsequently passed a small calculus. About six months later she began to exhibit symptoms which were ascribed to chronic nephritis. The urine contained albumen and pus, but no casts were found at this time. There was some tenderness in the lower abdominal region, but accurate palpation was impossible on account of rigidity of the rectus muscle.

When Dr. Hawkes first saw the patient about a week ago, a mass was felt per vaginam, posterior to the uterus and to the right of it, not unlike an old indurated Fallopian tube. The possibility of calculus was entertained. She complained of pelvic pain. An incision was made through the right rectus muscle, and a mass about the size of a man's thumb was felt just below the right Fallopian tube, in the position of the right ureter. After dissëcting up the peritoneum behind just below the level of the brim of the pelvis, the right ureter was exposed and incised, and a calculus weighing 158 grains removed. The incision in the ureter was closed with black silk, and the ureter was allowed to drop back into place. Drainage was established through the loin, the lateral peritoneal opening being closed. The kidney on the affected side, however, was evidently obliterated, and had ceased functioning, as no urine escaped from the incision in the ureter during the operation, nor has any been present since then in the drain. The operation was done eight days ago. The patient made an uneventful recovery, and is apparently out of danger. The calculus is about two and a half inches long, and seems to have been formed at the site of a spiral stricture in the ureter at this point. Its lower end was about an inch from the bladder, its upper one near the pelvic brim. It was surrounded by inflammatory tissue. It could not be milked down into the bladder.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, December 2, 1901.

The President, DE FOREST WILLARD, M.D., in the Chair.

TETANUS AFTER VACCINATION.

DR. RICHARD HARTE showed a boy that had been under his care at the Episcopal Hospital, a case of tetanus. He works in a hat factory, and is in the habit of handling skins, particularly of the rodent variety. Five days after vaccination the arm was slightly reddened; nine days after vaccination the wound was all right, except red and slightly ulcerated. When he was admitted to the hospital, October 25, his jaw was distinctly stiff. He complained for a day or two of a feeling of discomfort in the back. On admission he had a distinct trismus and tetanic convulsions. They were, from then on, very marked. He would be thrown into a state of convulsions by touching his leg or arm. There was opisthotonos, sometimes very marked; his body thoroughly arched, resting on head and heels, and sometimes at night he would have convulsions, where there was distinct pleurothotonos.

For treatment after admission, fifty cubic centimetres of antitoxin serum were injected, and, in addition, he was given chloral, morphine, and bromide freely. The convulsions were not apparently controlled in any way by the serum, but by full doses of chloral, ten grains every two hours for a while, until he came under the influence of it, the convulsions were controlled. When the effects of the chloral passed away, the convulsions would return.

The first day the antitoxin was given in doses of fifty cubic centimetres. Then it was cut down and continued cut down for many days, until he took ten cubic centimetres. The trismus he

had was very marked, but at no time was there any difficulty in nourishment. He did not complain very much of pain, and at no time did his temperature go above 102° F.; usually it was about 100° . For a long time the reporter did not think the boy would get well; but when he fought things out for ten days, then it looked as if he were destined to recover, and from that time on his recovery was very marked from day to day. There is nothing in the wound; just the remains of the old vaccination mark. There is nothing there to interest you.

DR. DE FOREST WILLARD remarked that the doubt expressed by Dr. Harte in the efficacy of the serum was shared by the majority of surgeons. He used the chloral and bromide. In a case that the speaker had succeeded in curing, he kept the boy for twenty-eight days under chloral, bromide, and morphine, absolutely saturated, and the disease did not yield until after twenty-eight days. (*Transactions of the Philadelphia College of Physicians*, xvii, 27.)

DR. SHOEMAKER said that there was one peculiarity in this case which distinguishes it from postvaccinal cases recently reported, viz., the shortness of the period of incubation. The others have run from the nineteenth to the twenty-fifth day generally, as was developed in a report and discussion regarding several cases at the Philadelphia County Medical Society. These reports made it very probable that there was postvaccinal infection.

DR. TAYLOR stated that he had only treated one case of tetanus with antitoxin, that of a boy of eight years, who first developed tetanus seven days after the receipt of injury, which was a punctured wound of the foot. In addition to antitoxin, he was given large doses of chloral and bromide, so that he was kept deeply narcotized. Whenever the chloral and bromide were diminished in amount, his convulsions recurred. This condition persisted for a long time, but he finally recovered.

This is one of the very few cases which he had seen recover where the symptoms developed soon after the receipt of the wound. Almost all cases of recovery reported after the use of antitoxin have been those of chronic tetanus.

DR. RODMAN reported a case of tetanus where the antitoxic serum was used subdurally, but the patient died on the fifth day, the time they usually die in cases of acute traumatic tetanus. Tetanus developed quickly after the injury. He agreed with Dr.

Harte that chloral and morphine are the best remedies we have. It would seem from an analysis of a great many cases of tetanus that exactly the same experience that Dr. Harte has had has been met with by many surgeons, that is to say, that while chloroform and morphine will relieve the spasms of tetanus, the results are not so abiding as under chloral. It seems undoubtedly to be the agent that controls the spasm better than any other drug. From the time of Hippocrates it has been recognized that if a case occurs after fourteen days it is apt to get well; certainly more than 50 per cent. recover.

He called attention to the statistics of Professor Yandell, of Louisville, who analyzed 415 cases,—the largest number analyzed by any authority. His statistics, taken in connection with those of the War of the Rebellion, show very clearly that if patients survive the fifth day after the onset of the disease, they are apt to recover. There is a marked falling off in the death-rate after the fifth day. This fact should lead surgeons to support the patient; feed them very judiciously, even under chloroform, with a stomach-tube; keep them in a quiet room; allay the spasms, and prevent irritation of any kind, either central or peripheral; by so doing, and keeping the patient alive until the fifth or sixth day, tide them over that period of greatest danger. He did not think that point had been sufficiently dwelt upon. If it was necessary, give chloroform, introduce a tube into the stomach, and feed systematically. He had seen cases recover under such treatment. There was no specific for tetanus. He thought the reports of Roux and others had been too optimistic.

DR. JOHN B. ROBERTS said that he had been very doubtful about these cases of tetanus being really caused by infection with the tetanus bacillus through the vaccination wound, because it is so common to have a wound of infection healed before the tetanic symptoms show themselves. A person vaccinated might readily attribute the disease to the vaccination, when infection had taken place through a small wound on the hand or foot which had been forgotten. He saw a case of this sort some years ago, where the child and his family declared that he had not been wounded. The symptoms were those of tetanus, and he soon was able to show a cicatrized wound on the hand, of which the boy and his family had not thought.

He mentioned a recent case of possible tetanus which he had

treated with tetanus antitoxin. He used the remedy, because he feared the patient might be developing tetanus, and he was afraid to wait until the symptoms should become sufficiently pronounced to make the diagnosis sure. A woman, aged forty-one years, was admitted to the Methodist Hospital with a wound of the right hand caused by a circular saw. The joint between the middle and proximate phalanges of the index-finger had been opened, and the extensor tendons of the index-, ring-, and little fingers had been cut by the saw. Tenosuture with fine silk was done, and a wet corrosive chloride of mercury dressing was applied. Five days after the accident slight pain was felt in the region of the masseter muscles, and there was perhaps a little stiffness when the woman attempted to open her mouth widely. The abdomen, however, was not rigid, and the temperature was below 100° F., running quite close to the normal line. Her pulse was from 72 to 88 and the respirations varied from 20 to 40 per minute. On the next day, which was the sixth day after the accident, she showed a slight tendency to frowning in the skin of the forehead when she tried to open her mouth widely. This, however, she could do without much difficulty. There was a slight tendency to sweating, and the temperature in the evening reached 99.8° F. Although there was no abdominal rigidity, the symptoms already mentioned, with slight pain in the back of the neck as well as in the jaw, made him fear to wait longer. He therefore gave her an injection of twenty cubic centimetres into the subcutaneous tissues of the abdomen. Her temperature fell to normal the next day, and even went a little below normal. The pain and stiffness gradually subsided, and she was discharged on November 22. From the first suspicion of tetanus, he gave her ten grains of chloral three times a day.

Her case is perhaps worthy of mention, though the testimony as to the value of antitoxin serum is indefinite, since the diagnosis was not established. On the whole, he thought it was better to give the remedy early in suspicious cases, because, when the disease is actually established, treatment seems to be of very little value in the great majority of cases.

DR. HARTE said, in regard to the remarks that Dr. Roberts had made as to whether there was any other previous evidence of traumatism about his case, that he felt quite confident that there was not. Again, with regard to the boy's vocation. He was

working in a factory, handling skins, handling the skins of rodents, a form brought from South America. That he was doing all the time. There was no protection to the wound; simply a granulation, a granulating sore on the arm; and, owing to the work he was doing, all the conditions were favorable for infection, which naturally made him think this was a case of true tetanus, due to infection, primarily through the sore, either from the primary vaccination, from the point itself, or from some material in the work he was handling.

INTESTINAL AND FACIAL ANTHRAX.

DR. DE FOREST WILLARD reported the case of a man, twenty-four years of age, a wool sorter, who was admitted to the Presbyterian Hospital, November 3, with a large sloughing ulcer in left cheek, one and one-half inches from angle of mouth, surrounding which ulcer marked œdema of tissue extended over the entire side of the face and across to right eyelid and forehead. The ulcer was dark with elevated and puffy edges, and a small circumferential area of dusky redness with circle of vesicles. The accompanying pain was only slightly burning and stinging in character. He had a history of burning and itching pains in a pimple which had appeared six days previously. This ulcerated on the second day, and the vesicles appeared almost simultaneously. Pulse 102; temperature 100° F.; respiration 20; his condition fairly good. The superficial cervical glands were enlarged.

The entire area of the carbunculous mass was dissected out, cutting deeply through the cheek down to the submucous layer, keeping outside of the vesicles. In the removed tissues anthrax bacilli were found abundantly, and cultures were readily obtained from the tissues, but not from the blood. The fresh wound was then cauterized with pure carbolic acid, thoroughly irrigated with bichloride 1 to 1000, and solution of potassium permanganate, and the whole left side of the face covered with a layer of mercurial ointment. On the following day the wound was irrigated with permanganate of potash, and pure carbolic acid again applied, followed by mercurial ointment. Quinine, fifteen grains, was given daily. Two days later the man began to suffer intense abdominal pain, which caused him to writhe in agony, and he had twenty-one stools in the twenty-four hours. Although his mouth

and breath showed no symptoms of ptyalism, yet, in view of the possibility of mercurial absorption, the ointment was discontinued. Later progress of the case, however, showed that the mercury was in no wise responsible for this condition, but that it was undoubtedly a local intestinal infection similar to that upon the face. This inoculation could readily have occurred through careless handling of food with unwashed hands. The infection could gain entrance through even the slightest lesion of the mucous coat of the intestine. The abdomen became tense and swollen, with marked evidences of enteritis and peritonitis, which symptoms persisted for two weeks. Vomiting was persistent, and the diarrhœa continued, though to a less degree. Pains were paroxysmal, but were controlled by morphine and paregoric. Fifteen grains each of salol and quinine were given daily, with moderate stimulation; also carbolic acid internally in small doses. His temperature rose to 104° F., and varied from this point to 102° for ten days. The abdominal symptoms did not abate. The tension of the abdomen was so great that the size of the spleen could not be determined. Milk was not borne at all, but raw and cooked eggs were retained. Enemas were of little service, as they were quickly rejected. On the fourth day streptococcus infection of the scrotum occurred with great œdema, which was relieved by free incision, irrigation, and drainage of about five ounces of pus. Antistreptococcic serum was then injected, twenty centimetres, upon six successive days. Either this or the evacuation of the pus from the scrotum lowered the temperature to 102° F., but the abdominal symptoms remained persistently. Vomiting of dark green fluid continued, and the diarrhœa persisted in spite of remedies. The œdema of the face slowly disappeared, and the condition of the facial wound improved decidedly. The scrotal wound was irrigated three times a day with permanganate of potash solution, and the facial wound washed and dressed with carbolic solution.

At the end of two weeks, the nausea, pain, vomiting, and diarrhœa still continued, with extreme distention and tenderness. The abdomen now showed through the tense walls evidence of an accumulation of pus in the left iliac fossa. The abdomen was opened three inches below, two and one-half inches to left of umbilicus, and three quarts of the most horribly offensive pus evacuated. The stench was so great that it pervaded the whole

hospital. This pus contained streptococci, but no anthrax bacilli nor coli communis. The collection was only slightly walled off from the peritoneal cavity, and no opening was discovered, consequently it was impossible to decide positively whether this infection was a streptococcic one along the line of the cord from the infected scrotum, or whether there had been a small perforation of the bowel from the anthrax ulcer. The cavity was thoroughly washed and drained with hot salt solution. It remained very offensive for several days, but gradually contracted. There has been no escape of feces, and the discharge is now small and non-offensive. It is washed three times a day with peroxide of hydrogen and creoline. The facial wound has filled to the level of the skin, and the scrotal wound is closing. Fortunately, the patient has had no lung or throat infection.

The man is greatly reduced in flesh, but is eating and sleeping well; has had a septic parotitis, but bids fair to recover.

This man's recovery was undoubtedly due to the prompt excision of the carbuncle, the evacuation of the pus, the faithful care of the Resident Physicians, and the untiring attention of two nurses, who for weeks patiently endured the dangers in the case. By the use of rubber gloves, protective clothing, etc., they fortunately escaped infection, and no contagion occurred in the hospital. The man was strictly isolated, and all contaminated material burned.

This case, so far as he was able to learn, made the tenth reported in Philadelphia. Doubtless there have been others unrecorded, as there are many morocco factories and tanneries in the northeastern section of the city. Mutschler (*ANNALS OF SURGERY*, October, 1901, p. 555) reports two cases under his care which were treated by circumferential injections of pure carbolic acid, and both recovered. They were situated so near to the eyelid that excision was not feasible. Of the ten cases, five died, and the fate of one is unknown. His own case of recovery is the only one of internal infection. The diagnosis was confirmed by discovery of the special bacillus in all these cases. All of them were workers upon hides or wool. Considering the immense number of hides that are imported from foreign countries, and the fact that it is very difficult for any government to prevent the cupidity of individuals from selling the hides and other portions of animals dying from anthrax, it is remarkable that more infec-

tions do not occur. The burning of every carcass entire would be the only effectual method of stamping out this disease.

DR. GIBBON said that he had a case of anthrax under his care at that time, and it was the second which he had seen in Philadelphia within two years. His first case resembled Dr. Willard's very closely: the lesion was upon the side of the neck, and the œdema extended down over the upper portion of the chest. The patient was engaged in loading vessels, and was accustomed to handling hides, and it was probably in this way that he became infected. The patient complained little of pain, and presented mild constitutional symptoms. The patient made a good recovery under local antiseptic treatment. Three days ago he saw the second case to which he referred. This was a colored man who drove a wagon for a morocco factory. He said he did not handle hides, but did clean up the yard about the factory, and in this way handled small pieces of hides. The lesion in this patient extends across the front of the neck, consisting of a thick, dark scab three-quarters of an inch wide and two inches long, around which is an œdematous area. There are no distinct vesicles, such as were seen in the first patient. This man presents, however, an enlarged gland above the lesion. The diseased area was excised and the base cauterized by Dr. Stewart. The patient suffers no pain and presents no constitutional symptoms, and is with difficulty kept from his work. In both of these cases the anthrax bacillus was found.

DR. JOPSON said that anthrax was more prevalent in Philadelphia and vicinity than had been supposed. When Dr. Ghiskey reported a case in the Episcopal Hospital in 1899, Dr. Jopson was only able to find three cases on record in the city in which a bacteriological diagnosis of anthrax had been made and confirmed. Since that time a considerable number of cases have been observed. Dr. Given observed one, Dr. Mutschler two, Dr. Gibbon has just described two, and Dr. Willard's case makes another one. And he ventured to say that if the attention of physicians was more often called to these cases, many cases previously regarded as erysipelas, cellulitis, or allied conditions would be found to be anthrax. Dr. Fussell had given him notes of four cases, treated by Dr. Kelly, of Manayunk, in which, though no bacteriological examination was made, all recovered under simple antiseptic treatment; yet, from the histories and location of the

lesion, it is likely the majority of them were cases of anthrax. Many cases of this nature are overlooked, especially in the manufacturing districts of the city, such as Kensington and Manayunk.

GANGRENOUS HERNIA.

DR. R. G. LE CONTE showed a fresh specimen of gangrenous ileum, illustrating a strangulation due to a band and a volvulus. The subject was a man, aged fifty-five years, who was admitted to the Pennsylvania Hospital in a moribund condition. The following meagre history was obtained. He had had a reducible right inguinal hernia for twenty years. Two days before admission the rupture became irreducible, with increasingly severe pain in the lower abdomen. Obstruction was apparently complete from the onset of the symptoms, and in a short time vomiting began, and was continuous until he died. On admission to the hospital he was in collapse, pulse very rapid, small, and thready, facial expression pinched and anxious, respiration entirely costal. The abdomen was greatly distended, universally rigid and tender, with a semicircular area of dulness extending from the right short ribs to the anterior superior spine of the left ilium. The abdomen was opened in the median line, and this loop of gangrenous bowel immediately presented. It was about two feet in length and four inches in diameter, and filled with dark, bloody fluid of a cadaveric odor. It consisted of the lowest portion of the ileum, strangulated by a fibrous band two inches in length, running from the mesentery to the ilium. In addition, there was a half-twist from right to left in the strangulated bowel. The fibrous band was thick and strong and evidently of long duration. It is probable that the volvulus had occurred, and, as a result of the twist, the fibrous band had been drawn taut, with the production of immediate and complete strangulation. In the presence of so serious a lesion, and with death impending, it was deemed hopeless to attempt further surgical interference. The patient expired shortly after removal from the operating table.

EDITORIAL ARTICLE.

KÖRTE ON THE SURGICAL TREATMENT OF GASTRIC ULCER AND ITS SEQUELÆ (PYLORIC STENOSIS, GASTRIC DILATATION, HÆMORRHAGE).

DR. W. KÖRTE and DR. J. HERZFELD, in the *Archiv für klinischen Chirurgie*, lxiii, S. 1, review their experience in the treatment of gastric ulcer and its sequelæ during a period of ten years ending December, 1900. In their opinion, in pyloric stenosis and allied conditions, an early diagnosis is not of special importance from the surgical stand-point. When early interference is indicated in gastric ulcer, it is usually on account of peritonitis from perforation. Gastric ulcers themselves belong to internal medicine; it is their sequelæ specially which call for surgical aid.

The chief indication for operation is pyloric stenosis resulting from scar contraction, and the consequent dilatation of the stomach. Less commonly, active ulcers, which have resisted all medical treatment, call for operation. The most important of these ulcers are situated near the pylorus, and the passage of food over them gives rise to severe pain and pyloric cramps. Repeated small hæmorrhages call for interference, while in cases of profuse hæmorrhage the propriety of operation is not so easily settled. Perigastric adhesions may fix the organ, occasioning severe symptoms necessitating operation. Perforation of the stomach walls forms a distinct indication for immediate operation, primarily to treat the resulting peritonitis, secondarily to close the perforation.

The dangers of operation (apart from cases of perforation) are distinct, especially as the patients are practically always ema-

ciated and weak from want of nourishment due to the long-lasting gastric disease.

Pneumonia is a frequent cause of death after operation. Chilling on the operating table, vomiting, embolism from the mesenteric and omental vessels, narcosis, all of these are given as causes of the pneumonia, but most of these causes are to the fore in extensive breast excisions without pneumonia resulting. The substitution of local for general anæsthesia does not decrease the danger. The most important cause of the pneumonia is the wound in the epigastrium, which interferes with respiration, especially with expiration. On account of the pain, the patient avoids coughing, and breathes as gently and shallow as possible; the result being retention of mucus in the bronchi.

The mortality of operations for non-malignant pyloric stenosis *without* grave complications was 26.7 per cent. up to 1897 in the clinics of Billroth, Czerny, and Mikulicz. Of course, deaths were more common in the earlier cases, while the surgeons were gaining their knowledge of the necessary technique. On the whole, one may consider the danger of operation to lie between 20 and 25 per cent.

The following remarks are based on a consideration of thirty-eight cases operated upon by Professor Körte between June, 1890, and December, 1900. Of the thirty-eight cases, twenty were male, eighteen female. Although more females suffer from gastric ulcer than males, yet the latter are more exposed to injury than the former, and the necessity of work leads them earlier to seek radical aid.

The duration of the disease was generally considerable, even up to twenty and thirty years. Nourishment had been bad in all the cases, while, as soon as the immediate effects of the operation had been overcome, the patients began to put on weight with rapidity.

Among the symptoms, gastric pain and vomiting were almost never absent. Hæmatemesis or signs of blood in the stools were present in eighteen cases.

Stenosis of the pylorus and gastric dilatation were noted thirty-two times. Stenosis *without* considerable dilatation of the stomach was found three times in young people. In four patients dilatation was accompanied by more or less marked gastropsis. The seat of stenosis was generally the pylorus; once it was in the duodenum, and in five cases the prepyloric district was the site of ulceration and stenosis. Ulcers in the last mentioned location can cause reflex contraction of the pylorus, and then lead to gastric dilatation before any true fibrous stenosis can arise.

Annular ulcers distant from the pylorus can, when contraction takes place, give rise to the "hour-glass" stomach. In thirteen cases the site of stenosis was so thickened that it appeared like a tumor, and could, in some patients, be felt through the abdominal walls. Extensive flat and bandlike adhesions were found in five cases fixing and narrowing the pylorus. The ulcer involved the pancreas or liver in several patients.

Hydrochloric acid was found distinctly twenty-four times, in traces three times, and absent four times. Lactic acid was found four times, once along with hydrochloric.

In typical cases the diagnosis is easily made from the history, —the vomiting, the pain after eating, the dilatation, and the distinct or increased hydrochloric acid reaction. If dilatation is absent, differentiation from "nervous dyspepsia" is difficult, and may require prolonged observation. Hæmatemesis is a very important symptom, but its absence does not negative the presence of an ulcer. The diagnosis between carcinoma and "ulcer stenosis" cannot always be made before operation. Youth, long duration of the disease, marked hydrochloric acid reaction indicate ulcer. One must remember that carcinoma may develop in the scar of an ulcer.

Operation for ulcer is most commonly called for in patients between thirty and sixty (twenty-six cases), and this is the carcinoma age. If in such cases hydrochloric acid is absent and lactic acid present, then the diagnosis of cancer must be made.

In Körte's cases the principal indication for operation was pyloric stenosis, which let its presence be known by the copious vomiting, pain, and motor insufficiency. Organic narrowing of the pylorus is an absolute indication; the troubles arising from an active ulcer are a relative indication for operation. In the latter cases the ulcers are usually located at or near the pylorus; the ingestion of food causes great pain; feeding becomes difficult, and in those, at least, who must earn their living the careful special regimen and diet necessary become impossible to carry out, and the patient is driven to seek relief through operation.

It is very difficult to give hæmorrhage its proper place among the indications for operation. When the hæmorrhage is slight, but is so continuous, or so often repeated, as to give rise to chronic anæmia, then operation is absolutely indicated. When the hæmorrhage is such as to threaten death from acute anæmia, it can generally be controlled by the physician; but if it persists or recurs after short intervals, the question of operation arises.

Operations for acute hæmorrhage are very difficult, and the chances of success are only moderate. The opening of the stomach to find the bleeding point severely taxes the strength of the weakened patient. To find the site of hæmorrhage is hard, as it is often located on the posterior wall or on some inaccessible part of the lesser curvature, and, as a rule, the ulcer has invaded some neighboring organ (liver, pancreas). Excision of the ulcer under such circumstances is impossible; and where it is mechanically possible, the weak state of the patient may render it inadvisable. Hæmostasis by means of the thermocautery, chemicals (chloride of iron), or packing, is uncertain. Ligating the bleeding point or the ulcer by means of a stitch (*umstechung*) is also uncertain on account of the action of the gastric juice.

Perforation of the stomach walls by ulceration is an absolute indication for operation, if the patient's condition is such as to give any hope of his surviving the operation. When the perforation is into the general peritoneal cavity, the operation must be

performed within a few hours; as a rule, however, these few hours have passed before the diagnosis is made and the operation can be arranged. Should operation be delayed on account of shock? The best treatment of the shock [Lennander] is the rapid cleansing of the peritoneum and closure of the perforation. All delay dims the prognosis.

If the perforation is not into the general peritoneal cavity, but is into the subphrenic space, then the prognosis is better for evident reasons.

Perigastric adhesions, even when they do not interfere with the pylorus, can constitute a complete indication for operation. Cases occur in which adhesions to the belly wall give rise to so much trouble that life becomes unbearable and nutrition almost impossible. How do the lesions recover after operation, and what can operation accomplish?

In cases of stenosis, the narrowed point may be resected (resection) or widened (pyloroplastic) or avoided (gastro-enterostomy). After such operations the gastric dilatation may diminish and tone be regained, but this cannot be counted on. Even after gastro-enterostomy, the dilatation of the stomach may persist, but the stagnation of the food is obviated.

It is more difficult to understand the curative influence of gastro-enterostomy on active gastric ulcers. Of course, the early escape of the ingesta from the stomach gives the ulcers more or less rest. As long as gastric hyperacidity persists, gastric ulcers are liable to recur or form anew.

When the stomach is perforated, one must content oneself with closing the perforation (if possible) and combating the peritonitis. Occasionally it may be possible to excise the ulcer.

Flat perigastric adhesions resulting from ulceration can hardly be cured by operation, since, even if separated, they will at once reform; nevertheless, the symptoms they occasion may be removed by means of gastro-enterostomy.

JOHN F. BINNIE.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. Treatment of Wounds after Operations for Localized Tuberculosis. By A. FRÄNKEL (Vienna). Local treatment is specially required after operations for tuberculosis, since rigid walled cavities are often left as well as remnants of diseased tissue, and, owing to general causes, the local regenerative powers are often below par.

Iodoform is the only one out of numerous drugs which has stood the test of use, and even it is, bacteriologically, no antiseptic. The general assumption that iodoform acts by slowly setting free iodine is weakened by the fact that exceedingly little iodine is excreted by the urine or found in the organs, and that the symptoms of iodine and iodoform poisoning are different, etc. Sterilization of iodoform at a high temperature drives all the iodine out of the drug without destroying its usefulness. The author carried out histological researches on wounds,—some impregnated with iodoform, others with indifferent powders of poor solubility (bone charcoal, wood charcoal, lycopodium powder). The indifferent powders were sometimes sterilized, sometimes not. Histologically, it was found that the tissues behaved identically under the influence of iodoform and of *non*-sterilized indifferent powders.

Sterile indifferent powders acted merely by stimulating the fixed cells to fibroplastic proliferation. The only difference between the reaction of the tissues to iodoform and to sterile powders is that in the latter case coincident inflammatory reaction is absent. The inflammatory and the fibroplastic reactions of iodoform are both valuable in tuberculosis, but these reactions are

not specific to iodoform. Iodoform may act in two ways: (1) on the active causes of inflammation by means of the different kinds of bacteria introduced with the iodoform; (2) by its fibroplastic power. This is the more important action of iodoform in cases of tuberculosis, and is purely mechanical.

For these theoretical reasons, the author has substituted for iodoform, in the treatment of local tuberculosis, pure sterile bone carbon. The carbon may be used as an emulsion in glycerin, as a pure powder rubbed into the wound after careful hæmostasis, or with gauze as a loose carbon-gauze tampon. The results obtained were identical with those from iodoform. After operations for cold abscess, bone and joint tuberculosis, where the disease was thoroughly removed, the best of results were secured by carbonizing the entire wound surface, and completely closing the skin wound. Healing took place almost constantly by first intention and without fever.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXX. Kongress; *Centralblatt für Chirurgie*, No. 29, 1901.

II. Method of Determining the Freezing Point of the Blood and of the Urine. By DR. H. KÜMMELL (Hamburg).

(1) Place a freezing mixture of ice and salt in a suitable glass vessel. (Kümmell uses Beckmann's freezing apparatus.)

(2) Place the fluid to be examined in a small glass cylinder provided with a fine thermometer. Constantly stir the fluid with a loop of platinum wire.

(3) Place the glass cylinder in the freezing mixture; continue stirring with the platinum loop.

(4) As soon as the fluid solidifies, the thermometer will show a certain temperature, which will remain constant for some time,—the physical freezing point of the fluid. Note this point.

(5) Repeat the experiment, using distilled water instead of urine or blood. The freezing point of distilled water is zero, C. The normal freezing point of blood is 0.56° C. below zero.

Twenty grammes of blood is the amount necessary for determining the freezing point, and is obtained by means of a hollow needle inserted into one of the arm veins, or, in exceptional cases, by venesection. The blood as it flows is caught in the glass cylinder. Centrifugation of the blood is unnecessary, as Hamburger has shown that the freezing point of the blood and serum is absolutely identical.—“Praktische Erfahrungen über Diagnose und Therapie der Nierenkrankheiten,” *Archiv für klinischen Chirurgie*, lxiv, 586.

THORAX.

I. Contribution to Pulmonary Surgery. By DR. FR. BORCHERT. Borchert's article is based on a careful survey of all the cases of pulmonary disease submitted to operation in the Urban Hospital during the last ten years. There were in all twenty-nine cases; in twenty-one of these the pulmonary disease was directly attacked in the operation, in the remainder the consecutive empyæma only was treated. The case records are given *in extenso* as an appendix to the “arbeit.”

(1) As long as acute inflammation is present operation is contraindicated. The most common and important indications calling for interference are those diseased conditions which are the result or later stage of acute inflammation. Such are

(a) Acute or chronic pulmonary cavities which show no tendency towards cure by internal treatment, but exhibit suppuration, tissue necrosis, and almost always putrescence.

(b) Bronchiectatic cavities in a state of ulceration or suppuration.

(c) Pulmonary abscess. The tissues of a section of the lung melt away, the suppuration being generally accompanied by gangrene without the formation of large tissue sequestra. The line between abscess and gangrene of the lung cannot be drawn with precision.

Operation is necessary when septicæmia or pyæmia threaten,

when the strength is being undermined, and when progressive tissue destruction, eroding vessels, makes hæmorrhage a pressing danger. Most pulmonary cavities are phthisical (tuberculous), and such are almost without exception outside the range of operative treatment. The cavities are surrounded by tuberculous tissues, the opening of the cavities has no influence on the disease of the neighboring structures, excision of the whole apex of the lung is generally insufficient for the removal of all the disease, although individual good results have been reported. It must be considered a lucky accident if one finds a case of tuberculosis of the apex and makes his diagnosis early enough to permit of an excision so complete as to leave no disease behind. Recognition of tubercle bacilli in the sputum negatives operation.

Tuberculosis often affects, secondarily, long existing cavities. In such cases recognition of the bacilli is difficult, owing to the amount of sputum and to the fact that its gangrenous nature interferes with the staining reaction of the bacteria.

Ulcerating and gangrenous bronchiectatic cavities have the same indications for operation as acute and chronic cavities. Large size, long duration of the suppuration, and large quantity of discharge call for operation even in the absence of putrefaction and gross tissue destruction.

Pulmonary abscess should be attacked surgically as soon as the acute stage of the disease has passed and no tendency to recovery is manifested. Too long delay is bad. Several operations were undertaken because of pulmonary actinomycosis, but the surgeon contented himself with the opening of peripheral abscesses and left the lung untouched.

The diagnosis must decide, first, the nature of the disease, and, second, whether certain conditions are fulfilled without which operation must fail. These conditions are (1) the definite location of the disease; (2) the extent of the disease such as to bring it within the possibility of surgical cure; (3) the absence of secondary foci of disease in the same or other lobes of the

lung. The diagnosis of the above conditions may be named "focal diagnosis" (Herddiagnose).

Acute gangrenous foci of destruction generally follow some pulmonary inflammation, while bronchiectatic cavities are usually chronic, and the patients give a history of profuse pulmonary discharge existing for a long time. Sudden evacuation of much pus *per os* after acute pulmonary disease points to the bursting of an empyema into the lungs. A history of hæmorrhage is important. The general condition of the patient is always poor. In several cases the fingers showed club-shaped deformity early, but this deformity disappeared on recovery.

The sputum is the best guide to the nature of the pulmonary disease; but discharge may be entirely absent when abscesses have not broken into the bronchi. The quantity of discharge may be very great, but may vary much from mechanical reasons. Mucous consistence points to bronchiectasis, purulent to chronic cavity or abscess. Elastic fibres or shreds of tissue in the sputum indicate ulceration, and the quantity of these tissues correspond to the intensity of the process.

Localization of cavities is exceedingly difficult, as also is estimation of their size and multiplicity. Bronchiectatic cavities are often multiple, less frequently are abscesses or chronic gangrenous cavities multiple, while cavities resulting from acute pulmonary inflammation are generally single. Diagnostic puncture is a most valuable aid in diagnosis, but it must be used with circumspection. Phlegmonous inflammation both of the thoracic and abdominal walls has followed puncture, hence the rule is formulated, never to make use of this diagnostic measure in gangrenous disease unless prepared to operate at once. Not uncommonly puncture evacuates a considerable amount of pus; but when the needle is reintroduced at a second sitting, as a preliminary to operation, no pus is found. It is not always easy to distinguish whether the aspirating needle has entered a pulmonary cavity or a thick-walled empyema. If the pus aspirated is similar to that coughed up, it

is probable, though not certain, that the needle has penetrated a lung cavity.

Skiagraphy has not proved of much value as an aid in diagnosis. In operating on the lungs, the author insists on the importance of securing obliteration of the pleural cavity at the site of operation. The disease frequently produces pleural adhesions, but to recognize their existence, absolutely, is extremely difficult, and even when they exist they may be soft and give way during the necessary manipulations. It is recommended to expose by excision of ribs an area of pleura as large even as the palm of the hand, and then with round needles to suture the parietal and visceral layers of the pleura before opening the cavity. Do not take up too much lung tissue in the stitch and do not tie too tightly. This quilting of the pleura should be extensive, so that a large surface of the lung is united to the pleura. To protect the pleura more securely against secondary infection, a strip of iodoform gauze may be sutured to the pleura. Provided that the tissues are not diseased to such an extent that the sutures will not hold, pneumotomy may be undertaken in the same sitting. Having protected the pleural cavity, superficial foci may be found by palpation and exploratory puncture with an aspirator. Beck uses a trocar and cannula, the trocar part of the instrument being practically a Paquelin cautery. When the needle has found pus, leave it *in situ*, and using it as a guide pass a themocautery into the pus cavity. Dilate the cautery wound with a dressing forceps or the finger. When the disease is superficial, hæmorrhage is easily controlled by the cautery, ligatures, suture, or tampon. In deep cases larger vessels are encountered; around bronchiectatic cavities they may be as large as the radial artery. For such vessels the cautery is useless, and one must use the ligature, suture, or firm tamponade. Vessels in the walls of such cavities may be aneurismal. Having opened the cavity carefully, introduce the finger and explore. Examine especially for macerated vessels passing through the cavity. In one case the operator found

several such, as large as the radial, and doubly ligated and divided them in two sittings with the aid of "cystoscopic illumination." Provide efficient drainage by means of further openings if necessary; before making a fresh opening always palpate carefully for pulsating vessels. If other foci of disease are recognized in the neighborhood open them. Carefully clean the cavity and introduce a drainage tube protected by gauze to avoid injury to vessels. Lightly pack with iodoform gauze. Do not irrigate except under rare circumstances. Tampon the external wound, do not suture it.—*Archiv für klinischen Chirurgie*, xliii, 400.

II. The Operative Treatment of Phthisis Pulmonalis. By DR. H. SARFERT (Berlin). Disinfection of pulmonary cavities by the Mosler-Hüber method has done more harm than good; drainage through small openings is inefficient, and interferes with natural expectoration by letting the air escape through the artificial sinus. More extensive operations have generally failed because they have been carried out at too high a level (first rib), and the cavity has been missed, or, if the operation has been at a lower level, pyopneumothorax has killed the patient. Sarfert has made numerous experiments on subjects who have died from phthisis (resection of the clavicle, ribs, sternum, etc.), and finds that in chronic tuberculosis of the apex reliable adhesions are present from the apex down to the third rib or lower. By excising the second rib from its sternal end to the axilla one can shell out the whole of the apex of the lung, delimit the cavities by palpation, and incise and tampon them extrapleurally without any fear of invading the pleural cavity.

The author operated in this manner on a woman who had a phthisical cavity the size of a small fist. Fever and hæmoptysis disappeared and the apex of the lung shrank into a mass of scar tissue. The patient felt well for six months, and then died of fibrinous pneumonia of the opposite lung. At the autopsy the apex of the right lung was found converted into connective tissue,

a few tuberculous nodules were scattered over the rest of the organ, and there were no other cavities.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXX. Kongress, 1901.

ABDOMEN.

I. Inflammatory Tumors of the Omentum. By PROFESSOR HEINRICH BRAUN (Göttingen). The author draws attention to some easily recognizable tumors which are found in the abdomen and which result from epiploitis; he does not refer to acute omental abscess, nor to inflammatory infiltration the result of appendicitis or of torsion of the omentum. The tumors under consideration most commonly are found after laparotomies in which the normal or inflamed omentum has been ligated and in part removed, *e.g.*, after herniotomy. They have been observed anywhere from four weeks to three years after the primary operation. The centre of the tumor usually consists of the silk ligatures used to tie off the omentum. The tumors are usually as large as an orange; they may be larger; and they may occupy almost any position in the belly. If the growth is adherent to the parietes, it is immovable; if it is non-adherent, it may be moved upward or laterally but not downward. The surface of the tumor is usually smooth, the consistence firm; only occasionally does it follow the respiratory movements to a trifling extent; on pressure it is tender. As the intestines lie posteriorly, percussion gives a dull note. The earliest symptom of the disease is localized abdominal pain with a slight elevation of temperature. Exceptionally, fever is high and is ushered in by a rigor. Frequently other peritoneal symptoms are noted, especially vomiting. The diagnosis is easy, although the tumor may be mistaken for a floating liver, an ovarian cyst, a spleen, or a malignant neoplasm.

As a rule, under appropriate treatment, the trouble decreases in the course of weeks or months, and may disappear entirely (fourteen out of thirty cases). Disagreeable symptoms due to

adhesions may persist for years. The inflammation may result in abscess. A small amount of pus may be resorbed and recovery follow; usually the pus is evacuated by incision or breaks into the intestine, and so escapes. Only exceptionally does the tumor remain stationary and death result.

Treatment varies according to the case. If the symptoms are not urgent, confinement to bed, regulation of diet, application of hydropathic dressings to the belly or abdominal inunction of mercurial or iodine ointments, often lead to recovery. If fever persists and the patient's health deteriorates, and especially if there is distinct localized tenderness, operation is indicated. When the tumor is firmly adherent to the abdominal wall, an incision may be made into it as if it were an abscess in any other location. If on incision no pus is found, one may remove a wedge-shaped portion of the mass to facilitate absorption of the rest. When adhesions are not present, one should excise the tumor unless doing so would involve injury to the transverse colon. If the disease is advanced and causes stenosis of the transverse colon, an entero-anastomosis may be in order. The prophylactic treatment of such omental tumors must be carried out in the original operation, and should consist in the most thorough asepsis, the use of catgut rather than silk for ligatures, the avoidance of mass ligatures, and the application of the ligatures to sound instead of to inflamed omentum.—*Archiv für klinischen Chirurgie*, lxiii, 378.

II. A New Method of Uniting the Recti Muscles in Cases of Median Postoperative Hernia. By DR. A. HAMMESFAHR. After laparotomies performed through the linea alba, the lateral abdominal muscles tend to pull the recti muscles outward while the pressure of the belly contents pushes them forward. The external edge of each rectus is fixed by aponeurosis, so that the inner edge is much more pushed forward than the former. From the above it will be seen that, if the inner edges of the two recti do not promptly unite, these muscles will separate

one from the other and *eversion* will take place. They will appear like the leaves of a double door opened outward (the outer edges of the muscles being hinged by the abdominal fascia). Based on these facts, Hammesfahr devised the following method of operating, and used it successfully in a case of large hernia which had recurred after eight attempts at radical cure. Through a median incision separate each rectus from both its *anterior* and *posterior* connections, being careful not to disturb its sheath, and not to open the peritoneum. Pass a half-blunt needle armed with strong wire through the aponeurosis immediately external to the left rectus. With the finger of the left hand passed *behind* the muscle guide the needle to the junction of its inner and middle third; at this point make the needle transfix the muscles from within outward. Carry the wire across the gap between the muscles, and at a corresponding point make it transfix the right rectus from without inward, and pass between the muscle and the peritoneum to the outer edge of the former, where it is made to emerge through the aponeurosis. When the wire is twisted, the recti are brought into their normal positions, and their inner edges slightly inverted, somewhat after the manner of an intestinal wound closed by Lembert sutures. Several wire stitches will be required. They should be introduced three to four centimetres apart.—*Centralblatt für Chirurgie*, 1901, No. 10.

JOHN F. BINNIE (Kansas City).

III. Forcipressure in Gastric Surgery. By DR. O. LANZ (Berne). This procedure does not imply the use of clamps merely to prevent escape of stomach contents, but is the use of powerful forceps, exercising such pressure on the stomach walls as to cause their agglutination. This accomplished, suture of the walls according to ordinary rule follows. The method is in imitation of the use of the angiotribe on the ligamenta lata uteri prior to removal of uterus; the aim of the author being to resect the stomach without apparent opening of its lumen.

Experiment.—A loop of intestine (dog) was subjected to great pressure, three minutes, until opposing walls in agglutinated state were as thin as paper. At this thin level the bowel was divided with cautery; but a subsequent attempt to suture was followed by hæmatoma, which forced apart the compressed walls of intestine, and thus marred the operation. Two other attempts were similarly conducted, save that narrower clamps were substituted, after five minutes, for the ordinary stomach clamps (Kocher). While the clamps were on, four sutures were placed, the clamps removed, the sutures knotted, and a circular enterorhaphy performed. One animal succumbed to peritonitis from faulty technique, the other survived, and death induced one month later failed, in spite of careful search, to reveal the site of resection. Then follows a narrative of two cases of carcinoma ventriculi in which this method was successfully employed in performing resection of the stomach. The Roux angiotryptor was used. The technique may be summarized as follows: (1) Application of angiotryptor to a wide area. (2) After lapse of five minutes, two powerful narrow artery clamps replace these. Division of the compressed segment of bowel with the Paquelin close to the tumor on stomach side. With narrow clamps *in situ* suture is performed. The duodenal stump can be efficiently dealt with (Roux) by simply applying a ligature *en masse* to the furrow of compression. For the stomach end this does not apply. Author does not give this latter modification his support. Specially constructed clamps are necessary for this method.—*Beiträge zur klinischen Chirurgie*, Band xxx, Heft 3.

IV. Anatomy and Surgery of Gastro-Enterostomy. By DR. PETERSEN (Heidelberg). This investigation is to dispose of the shortcomings credited to Von Hacker's posterior gastro-enterostomy, particularly regurgitation. This gastric ileus has been attributed to the following factors: (a) Compression of the efferent loop; (b) adhesion to the omentum; (c) obliteration

tion of the orifice in the mesocolon; (*d*) valvular formations in efferent loop by discrepancies in the size of the gastric and intestinal orifices; (*e*) plugging of the fistula by the intestinal spur; (*f*) closure of the efferent loop by a spur from the stomach or intestine. Of all these, spur formation is most frequently at fault.

Of 215 posterior gastro-enterostomies done at Czerny's clinic, forty-five were sutured, 170 performed with the Murphy button, and in no instance was regurgitation encountered. In sixty instances cited by Von Hacker himself once only was serious regurgitation met, due to stenosis of the efferent loop, and Von Hacker used the Murphy button but nine times. The author attributes the discrepancies in the reports of various surgeons using Von Hacker's method to the widely varied interpretation and application of the topographical, anatomical points of this operation.

In the first place, the position of the stomach is not perfectly vertical, and certainly not horizontal, but about sixty degrees inclination, and with a slight torsion towards the front.

Again, the first part of the duodenum ordinarily is pictured coursing from left to right. This holds good for the empty stomach, but in filled state the duodenum tends to right itself in the sagittal plane, owing to the displacement of the pylorus towards the right. While these shiftings obtain in the normal, one finds that in the dilated stomach the horizontal part of the duodenum is obliged to take an oblique course, from the right below, to the left above.

The second part of the duodenum retroperitoneal (non-mobile) lies to the right of the second lumbar vertebra, and the horizontal part crosses the third lumbar vertebra, thence making a sharp bend upward again to terminate at the first lumbar vertebræ or its junction with the second. This point is the site of the duodenojejunal fold.

The lowest point of the greater curvature in the normal stomach is at a lower level than the duodenojejunal junction; all

the more so is this the case in the greatly dilated pathological stomach subjected to operation. Here the jejunum courses for quite a distance in the vertical direction along the posterior stomach wall separated from it merely by the mesocolon. Hence only such an operation may be deemed physiological which takes advantage of these topographical conditions. The length of the efferent loop is therefore to be equivalent to the distance from the plica duodenojejunalis to the site of the anastomosis. This is the "physiological length," which will vary with the degree of dilatation. We also must take advantage of the "physiological position" affecting the anastomosis. As the jejunum lies *in situ*, vertically, we will have no right nor left loop, but one section of bowel above and another below, with the fistulous opening in the centre. Thus followed out, all accessory operations to guard against regurgitations are superfluous, and Von Hacker's method is the best. Its limitations lie in other directions than mere regurgitation.

Stenosis of orifice in mesocolon is obviated by suture of its cut edges. Gangrene of the colon can be avoided by choosing a place in the mesocolon for the perforation that is void of vessels. Compression of the anastomotic loop by the colon has only been once reported, and closure of the anastomotic opening likewise. There finally remains the gravest charge, that of difficulty of the operation.

Contrasted with anterior gastro-enterostomy, posterior gastro-enterostomy is always the easier the greater the gastric dilatation, and if the incision be large, it can be performed extraperitoneally. The use of the Murphy button greatly facilitates the technique. The ultimate gain from the functional stand-point in posterior gastro-enterostomy far outweighs the advantage of anterior gastro-enterostomy, which must for functional efficiency be combined with entero-enterostomy.—*Beiträge zur klinischen Chirurgie*, Band xxix, Heft 3 (Schluss).

MARTIN W. WARE (New York).

REVIEWS OF BOOKS.

A TREATISE ON SURGERY BY AMERICAN AUTHORS. Edited by ROSWELL PARK, M.D., Professor of Surgery in the University of Buffalo, New York. New (Third) Edition in one Royal Octavo Volume of 1350 pages. Philadelphia and New York: Lea Brothers & Company.

This large volume of nearly 1400 pages, replacing the earlier two-volume edition, is really an entirely new work rather than a new edition, so important and extensive are the additions and changes which the editor has seen fit to make. Dr. Park has recognized the rapidity with which medical science advances in these days, and by the issue of this volume has made it almost a necessity for the possessors of his earlier edition to possess this the latest exponent of Modern Surgery.

It is always a pleasure to be able to speak well of a book, for, while it is the function of a reviewer to be judicial, praise flows more readily from the pen than adverse criticism. Without in any way desiring to minimize the medical literature of other countries, the reviewer hopes that he does not transgress the limits of a due modesty when he congratulates his own countrymen of the United States on the general excellence of the medical literature for which they are responsible. Within the past three years a number of really notable works have issued from the presses of American publishers, as, for instance, Kelly's remarkable work on Gynæcology, an epoch-maker in its way; Cullen's equally fine treatise on Cancer of the Uterus; the notable work of Warren and Gould, and now the present volume of Dr. Park, the latest achievement in book-writing and book-making.

To speak of the volume under consideration, from the book-maker's point of view, it has been sent into the world well clothed, not shivering in thin paper and flimsy binding. The types are clear and perfect, the exceptionally fine illustrations done on fine paper of a sort to do full justice to the art of the illustrators. The microphotographs are particularly good, and may be said to reproduce the original slides with fidelity. Many are the alleged reproductions of similar subjects which look more like war maps of South Africa than microphotographs. No such criticism can be made on the illustrations of this volume. In short, it is a guest which we shall all welcome to our libraries and place on the most convenient shelf.

Sixteen of the fifty-six chapters have been written by the editor, and constitute some of the best and most valuable part of the book. The remaining chapters have been penned by men whose names are household words in the medical world. The work has been divided into six parts. Part I, six chapters, is devoted to surgical pathology, and, with the exception of the chapter relating to blood analysis, has been written by the editor. It has little in common with similar treatises penned but a few years since. The authors of those days were the pathfinders, and their successors now reap the fruit of their labors. The chapters on inflammation are written entirely from the modern stand-point of bacteriology, and, with this newest of medical sciences to furnish the clue, the author threads the labyrinth of those diseases which are caused by germ life. A sufficient account of the different bacteria is given without expanding the chapter to a treatise on bacteriology. The division of pathogenic bacteria into obligate and facultative pus producers seems a useful classification. The chapter on blood analysis is excellent. The plates in this chapter particularly are a credit to author and publisher alike.

Part II is devoted to the consideration of surgical diseases, and, with the exception of chapters twelve and thirteen, is written entirely by the editor. The subject is treated primarily from

the stand-point of the pathologist, which is entirely in line with modern methods. With regard to the early amputation of tubercular extremities, the author is apparently more radical in his views than the orthopædic surgeons, and adds, perhaps as justification of his views, the remark that the maker of artificial limbs now supplies a member that is vastly more useful than one that has been crippled by this infectious disease. This is undoubtedly true for those who have the price of the artificial limb; but it must be remembered that most of the victims of this disease are in the poorer classes, and with them it is a choice of a crippled limb or none at all. Brief chapters on Syphilis by Fordyce and on Gonorrhœa by Belfield complete this section. They compress much information in a small space.

Part III devotes three brief chapters to a consideration of surgical principles and minor procedures in Surgery. The processes of injury and repair are discussed in Part IV by Dr. Nancrede.

Part V describes the surgical affections of the tissues and tissue systems, its most important chapter being that written by Dr. Park on tumors.

With reference to the origin of the malignant tumors, in accordance with the author's well known views, more emphasis is placed on their probable parasitic origin than has been given in any recent work. The hypothesis of Cohnheim has been treated with respect, and given the place which it certainly deserves, particularly as to the Teratomata. The whole matter is handled with temperance and caution. While few pathologists will agree that the parasitic origin of cancer has been proved from the clinical stand-point, it seems that if we are to have hypotheses, the parasitic hypothesis explains more of the clinical phenomena of the disease than does that of Cohnheim. The chapter on the lymphatic system contains some excellent diagrams of the lymph system throughout the body. Few surgeons will agree with the author, Dr. Gerrish, with respect to the advantages of the piece-

meal removal of tubercular glands. The tendency to-day is to remove the whole of the diseased tissue in one mass as far as possible.

The chapter on fractures, revised by the editor, is as complete as one can expect in a work on general surgery. That on dislocations seems rather brief, containing only twenty-three pages. The same fault appears in the chapters on operative surgery, particularly those which deal with the surgery of the eye and ear, also plastic surgery. The general practitioner certainly ought not to attempt operations on the eye and ear, and sketchy accounts of difficult operations are alike useless to him and to the special surgeon. It is the fashion to add chapters on these subjects on all works on general surgery, but with doubtful benefit to the usefulness of the work. An incomplete and condensed account of an operation is of no use to any one, and simply occupies valuable room which could with more advantage be devoted to a fuller consideration of the subjects which are essential to all practitioners. It is perhaps difficult to draw the line, but "special subjects to special works" might be a good motto for the writers of one volume works on surgery.

Richardson's chapter on abdominal surgery is, as one would expect, excellent, but is fairly subject to the criticism that, in the effort to make it complete, rare and unusual operations within the province of the expert operator only have been given pages of description which belong to a work on operative surgery rather than to a work of this character, which it seems to the reviewer ought to be written for the mass of medical men rather than for the few who are likely to attempt such procedures.

Part VI is devoted to the consideration of special or regional surgery, and concludes the volume. Many of the chapters are of the highest excellence. That on hernia by Richardson leaves nothing to be desired both for lucidity, description, and clearness in the illustrations. The whole work is a credit to American authors and publishers alike.

ALGERNON T. BRISTOW.

ANATOMY, DESCRIPTIVE AND SURGICAL. By HENRY GRAY, F.R.S., Lecturer on Anatomy at St. George's Hospital, London. Thoroughly revised American from the Fifteenth English Edition. In one imperial octavo volume of 1246 pages, with 780 illustrations. Philadelphia: Lea Brothers & Company, 1901.

It is forty years ago that the writer in beginning the study of medicine had placed in his hands a copy of Gray's Anatomy. The profit and pleasure which he then derived from its use were due to its accurate, systematic, and clear descriptions, and to the abundance and perfection of its illustrations. In this latest revision, which he now finds on his desk, he sees all of the old and familiar features retained, and much that is new introduced, so that the book retains its unquestioned pre-eminence as the text-book in anatomy for the ordinary use of English-speaking students. To say this does not in the least detract from his appreciation of the great works of Allen, McClellan, and Gerrish, to speak only of our American authors. These latter seem to supplement the older work, which still maintains its place as the standard. The changes in the present edition are most notable in the sections devoted to the nervous system, a department which has been revolutionized during the past decade.

LEWIS S. PILCHER.

TUMORS OF THE URINARY BLADDER, OPERATIVE AND INOPERATIVE. By E. HURRY FENWICK, F.R.C.S., Surgeon to the London Hospital, etc., etc. Pp. 115. London: J. and A. Churchill, 1901.

The subtitle of this little book, "A Clinical and Operative Study based on Five Hundred Cases," at once explains its reason for being. A study of its pages convinces the reader of its usefulness.

The cystoscope, with remarks on its value in diagnosis and its

technique, its limitations, and especially some sound advice when to use it and when not, and chapters devoted to three varieties of vesical tumors, with a synopsis of operative procedure and a table of cases, are included in this eminently practical volume.

The clinical diagnosis of "villous covered benign growths, bald, malignant, and villous malignant growths" takes up the major portion of the book, the attempt being made to differentiate them by their cystoscopic appearance; the order in which hæmaturia, tenesmus, purulent cystitis, kidney pain, and the like appear; and the sensation imparted to the examining finger, where they are palpable. The importance of observing the so-called "symptomless hæmaturia" in its relation to bladder growths is particularly dwelt upon.

A tendency to discursiveness here and there somewhat obscures the sense, but in the main it is excellent reading. The frequent appeals for gentleness in examination, and the intelligent conservatism which marks the entire work, cannot be too highly commended.

HENRY .GOODWIN WEBSTER.

THORACIC INJURIES INVOLVING THE LUNGS.¹

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MODERN surgery has been slow to extend its operations to the thoracic cavity and viscera. In deterring the surgeon from attacks upon them, two justly dreaded dangers have been prominent,—the danger of collapse of the lung from pneumothorax, and of infection of the pleura.

It is my purpose, in the present communication, merely to narrate two cases of injury to the lung that occurred during my recent service at the J. Hood Wright Memorial Hospital, and to discuss some features they presented, for the management of which I found myself not altogether prepared.

It has been held until recently by most surgeons of prominence, and the opinion is still strongly supported, that in the treatment of cases of injury to the thoracic viscera the wisest and safest course to pursue is one of operative non-interference, even in the presence of the most alarming hæmorrhage. It is claimed that such hæmorrhage, even when from large vessels, is apt to undergo spontaneous arrest, and that by declining to open the thorax there is less danger of the infection of the pleural cavity following. Within the past few years numerous advocates of a more aggressive policy have arisen, and some are extremely radical as to the indications for operative interference after thoracic traumata, going so far as to advocate operation at least of an exploratory nature

¹ Read before the New York Surgical Society, December 11, 1901.

when there is reason to believe that even an intercostal artery may have been injured. This would involve making an incision in almost every case of fractured ribs.

It is possible, from a review of a considerable number of discussions and cases scattered through the literature of the last five or six years, to reach some conclusions as to the indications for operative intervention in injuries to the lungs or pleura. The combined experiences in operative procedures are still too few to have settled the best treatment of a number of details of the varied lesions that may be met with when the thorax is opened.

CASE I.—Rupture of Lung without Fracture of Rib; Distending Pneumothorax not relieved by Aspiration.

A fifteen-year-old boy was run over by a wagon, the wheels of which passed over the upper portion of his body obliquely from above downward and from left to right. When brought to the hospital, he was somewhat cyanotic and had urgent dyspnœa, with a feeble pulse of 130 and respirations of 56 per minute. There was a contusion over the left clavicle, but no bones were broken. He was put to bed with an adhesive strap around the upper part of the chest, and ice was applied on the left side. Oxygen inhalations were given, as well as morphine and nitroglycerin. His condition improved somewhat during the succeeding night, but when I saw him the next morning he was still suffering from severe dyspnœa, and complained of pain in the epigastrium and left chest. There were no signs of abdominal injury. Over the front of the left chest the percussion note was dull, and bronchial breathing and some peculiar râles attributed to interstitial emphysema were heard. Cardiac dulness began at the left margin of the sternum and extended to the axillary line in the fifth intercostal space, where the apex beat could be felt in a limited area. Over the right chest anteriorly the percussion note was tympanitic with a metallic ring, and breathing was diminished. Liver dulness began at the level of the eighth intercostal space. Motion on the right side of the thorax was much restricted. There was no subcutaneous emphysema, nor had there been any hæmoptysis. Respirations were 60, pulse 144, temperature 103° F.

With an aspirating needle I punctured his right chest, but, although the point of the needle moved freely in a large space, I was unable to pump out more than a very trifling amount of air. The apex beat of the heart did not move perceptibly nearer the median line, and the relief to the dyspnoea was very slight indeed. I introduced the needle again after testing it outside the chest, and used suction both from an ordinary bottle aspirator and from an extemporized Sprengel's pump, but without getting out any more air.

Later in the day, the breathing became less difficult, and the boy was comparatively comfortable under continued stimulation. At midnight his pulse was reduced to 98 and respirations had dropped to 36. But a few hours later he grew rapidly weak, and, although freely stimulated, died thirty-four hours after being injured.

The autopsy showed that no ribs had been broken. The right pleural cavity contained a large quantity of air and ten ounces of blood. The lung had but two lobes and was collapsed. Its posterior portion was consolidated. There were two ruptures of the lower lobe. One extended from the anterior border to the fissure, the other from the anterior border almost to the hilum through the parenchyma, but not through the pleura in its whole extent. Onto the ruptured surface opened a large bronchus. The sides of the rupture were adherent to each other except for a space of about an inch near the anterior border. The left pleura contained no air, but five ounces of bloody serum. The anterior border of the lung only was well aërated, elsewhere it was congested and oedematous. There was emphysema of the mediastina, all other viscera normal. On opening the peritoneum, the liver had been found displaced downward, its edge being three inches below the free border of the ribs.

With so small an effusion of blood, it was evident that the pneumothorax had caused death. Had the boy lived a little longer, I had intended to make another attempt to relieve him by introducing two needles into the pleural cavity, and filling it with salt solution by one, while the air escaped by the other (as suggested by Witzel). In all probability a second large outpouring of air had occurred shortly before he died, from the giving way of the adherent lung wound surface as it expanded again when the primary effusion of air had been sufficiently absorbed.

CASE II.—*Pistol-shot Wound penetrating Lung; Excision of Rib for Hæmothorax; Death from Infection with Bacillus ærogenes capsulatus.*

On October 19, a man aged twenty-four years was admitted to the hospital soon after receiving a wound from a .32-calibre revolver. The wound of entrance was half an inch below the right nipple, and there was no wound of exit. There had been no hæmoptysis. The patient complained of weakness and dyspnœa, pain in the epigastrium and over the upper part of the sternum. He was in severe shock. The heart's impulse was feeble. Over the right base posteriorly were dulness on percussion, diminished voice and breathing. The skin was cold and covered with sweat, pulse 104 and feeble, respirations 28 and labored.

After cleansing the wound and applying a sterile dressing, he was put to bed with an ice-bag to the chest, and stimulated with strychnine. Saline solution was injected subcutaneously, and also given with whiskey per rectum. His condition grew steadily worse, and when I saw him, four or five hours after the injury had been received, he was pale and cyanotic, very restless and thirsty, and had shallow, labored respirations. There were neither hæmoptysis nor external hæmorrhage. The right pleura appeared to be almost full of blood, flatness on percussion reaching as high as the spine of the scapula posteriorly.

October 20.—Under light ether narcosis, an incision was made at the site of the wound and carried down to the pleura, which had been punctured by the bullet in the fourth space. This opening was slightly enlarged, whereupon blood with a small quantity of air rushed out freely with each expiratory act. The blood could not be pumped out, as it was for the most part coagulated. The wound was extended towards the axilla, about four inches of the fourth rib resected, and the pleura opened for this distance. The pleura was evacuated of nearly two litres of coagulated and fluid blood with the hand and pieces of gauze. The lung was collapsed. It was caught with forceps and brought in part out of the wound and examined. There was a small wound on the anterior surface surrounded by an area of slight consolidation. Palpation detected no bullet nor the aperture of exit from the lung. A large strip of wet sterile gauze had been introduced to check motion on the part of the lung or mediastinum during respiration. Withdrawing this, it was seen that the bleed-

ing had ceased. During this time respiration and pulse were both very poor and the patient cyanotic. Strychnine was given subcutaneously, and oxygen was administered, while saline solution was injected at first subcutaneously, but afterwards into a vein of the arm. The pleural cavity was now filled with saline solution (it held two litres) and the wound closed with interrupted sutures. The operation took but twenty minutes, and an hour later the pulse was 100 and of good quality.

Some hours later it was found that a suture had slipped and allowed the wound to open slightly. Much of the saline solution had escaped into the large dressing, and there was some subcutaneous emphysema. The wound was occluded by adhesive plaster straps over a few layers of gauze. In the afternoon the pulse and respiration were both rapid, and the temperature rose to 105° F.

The next day the temperature ranged from 102° to 103° F., the pulse-rate dropped from 140 to 116, and the respiration from 40 to 20. There was a little more emphysema about the thorax. Considerable pain was complained of in the thigh, where salt infusions had been given. During the ensuing night a gangrenous inflammation, with the production of gas, spread rapidly from the thigh, and the patient died on the 22d, fifty-two hours after the operation.

At the autopsy subcutaneous emphysema was present throughout the entire body, except the head and right leg and upper extremity. The bullet lay embedded in the outer wall of the œsophagus, one inch above the diaphragm, just over the aorta. It had penetrated the lower lobe of the lung from a point three inches from its anterior margin to a point two inches from the pulmonary artery. Slight hæmorrhage and inflammatory reaction had taken place along the course of the bullet. There was a little fibrin on the upper portion of the pleura, but there had been no further hæmorrhage. Both lungs were congested and œdematous, all the other viscera normal.

In this case I was led to operate by my belief that the hæmorrhage was continuing, and that the patient, if let alone, would die within a few hours. His condition was not made

worse by the small amount of ether used in anæsthesia, nor by the short operation.

The cause of death was infection with *Bacillus ærogenes capsulatus* found in pure culture in the tissues by Dr. Le Wald. This is an unusual infection in thoracic lesions. Levy¹ and Nichols² each observed a case of pneumothorax due to infection with this bacillus. Finley³ reports a case of pneumothorax due to *Bacillus coli communis*; May and Gebhart,⁴ one due to *Bacillus coli* with *Staphylococcus pyogenes aureus*; Spence,⁵ a case of gaseous abscesses in the right pleura, thigh, and buttock due to colon bacillus in a case of tuberculosis of the ribs and lung. Curry⁶ reports two cases where *Bacillus ærogenes* was found in pneumonia, and one in gangrene of the lung.

In this case I was in doubt as to what to do with the bullet wound in the lung when I found the hæmorrhage was arrested. Should it be sutured with a purse-string or other suture? Should the lung be sutured to the chest wall or left in its collapsed state? Should the pleural cavity be tamponed with gauze or drained at a dependent portion or through the wound? If closed, should it be filled with salt solution or left containing air?

In trying to find an answer to these questions, I have looked at most of the recent current literature on the subject, and will try to gather here some of the results.

In thoracic traumata the special symptoms of injury to the lung are hæmoptysis, hæmothorax, pneumothorax, and subcutaneous emphysema. But the lung may be penetrated without the occurrence of a single one of them,⁷ and the presence of any one alone cannot be considered positive proof of the existence of a wound of the lung. Emphysema may occur in wounds of the thorax even without penetration of the pleura. Pneumothorax may occur in penetrating wounds of the pleura though the lung is not injured. Hæmoptysis after contusions or in cases of thoracic wounds points very strongly to pulmonary injury, but may be due to hæmorrhage from a cavity or other tuberculous lesions.

Penetrating wounds of the thorax are frequently associated with injury to the lung, and in considering the necessity for operative interference, it is important to bear in mind that they may also penetrate the diaphragm or abdominal viscera. Whether produced by a bullet or knife, penetrating wounds of the thorax are comparatively rare in this community. Matas, however, from New Orleans, reports⁸ 245 wounds of the thorax, "almost all penetrating," treated in one hospital within a period of five years. Thirty-nine of these cases, or 11.8 per cent., died. Matas stated that hæmorrhages are fatal that occur from the heart, the aorta, and its large intrathoracic branches, the pulmonary artery and vein before their entry into the hilum, the vena cava, and the venæ azygos.

Injuries to the pleura and lungs occur most often in connection with fractures of the ribs. During the period from January 1, 1895, to November 1, 1901, there were admitted to the wards of the J. Wood Wright Memorial Hospital, in the services of my colleagues, Drs. Hotchkiss and Parker, and myself, eighty-two cases of fracture of ribs without external wound. Many of these cases had multiple injuries, so that the sixteen deaths among them are not all attributable entirely to the thoracic injury, as some died of lesions of the head or abdominal viscera. I have collated the histories to determine the frequency of emphysema, hæmoptysis, and other symptoms in fractures of the ribs.

Emphysema is not so very rare in hospital cases of fracture of the ribs. Paget⁹ quotes Poland as finding it nineteen times in 136 cases, and Settegast three times in twenty. In our eighty-two cases it occurred twenty-six times, a much larger percentage. All but three cases recovered in which it was noted. It persisted fourteen days in one case and sixteen days in another. Hæmoptysis was noted twelve times, but did not begin in one case until more than forty-eight hours after the injury. In the fatal cases, this symptom was observed six times, was absent four times, and not noted six times.

Either hæmoptysis or emphysema are recorded as present together four times and separately in thirty-four cases. The

bloody sputum appeared to be due to lung injury in all the cases but one, in which pulmonary tuberculosis was subsequently discovered.

Pneumothorax was definitely recorded as present in but one case. This apparent rarity of it is due to the fact that these cases seldom had complete and careful physical examinations of the chest made, but were kept as quiet as possible after a strap had been applied to limit the movements of the chest wall. If one may draw conclusions from the numerous cases in which cyanosis and dyspnoea are recorded with respirations over thirty per minute, in one case forty to forty-four, and in another forty-eight, pneumothorax was not infrequently present, though not recognized. Indeed, it is hard to believe that in all but one of the twenty-six cases of emphysema the torn lung was so grasped by or between the fragments of ribs that air escaped into the subcutaneous tissues and not into the pleural cavity, or that pleuritic adhesions at the site of injury prevented the development of pneumothorax.

Hæmothorax also was not specially sought for, and was recorded but six times, twice in the accounts of autopsies only. Twice bloody serum was aspirated after some days or weeks. Pneumonia occurred six times in three cases that died, and three that recovered.

In five of the fatal cases lesions of both thoracic and abdominal viscera occurred; in one the lungs were not damaged, and death was due to a rupture of the liver, the ribs of the same side having been broken.

Injury to the lung was demonstrated or probable in forty-one, or 50 per cent., of the cases, and of these eleven, or a little more than 26 per cent., died. Rarely the lungs are injured without the production of an external wound or fracture of the ribs, as in my first case.

The chief causes of mortality in thoracic injuries are hæmorrhage, collapse of the lung caused by hæmothorax or pneumothorax, and arrest of the heart's action by damming up of effused blood in the pericardium (*herz-tamponade*). (Froriep¹⁰ analyzed twenty-one cases of death among thirty-

one of hæmorrhage with injury to an intercostal artery, and found but one case in which the hæmorrhage from the intercostal artery could be considered the only cause of death.)

Following these in point, both of time and frequency, are the deaths from subsequent inflammations, pneumonia, abscess or gangrene of the lung, and empyema. The earlier and more numerous and extensive operations done for these secondary conditions have considerably lowered the former death-rate from such causes. Most of the operations done for traumas to the thorax have been performed after septic phenomena have developed.

Many penetrating wounds of the thorax, where the injury to the lung has been considerable and the hæmorrhage abundant, produce few, if any, serious symptoms, and recovery follows smoothly and promptly under appropriate and "conservative" methods of treatment. Without question, recoveries do sometimes follow the most alarming conditions produced by hæmothorax or pneumothorax when absolute quietude is maintained. But under the expectant plan of treatment the death-rate remains high in cases of large hæmothorax. Nélaton gave it as 50 per cent., while the mortality for penetrating wounds of the thorax in general is estimated at but 12 per cent.

It is useless to base any argument as to treatment on the mere fact of a penetrating stab or gunshot wound or lung injury. More important factors are the amount of hæmorrhage and the degree of collapse of the lung produced either by pneumothorax or early or late hæmothorax. The probability of infection of the wound having been caused is also important. Infection may be introduced at the time the wound is inflicted with the weapon, or during surgical manipulations, or may extend from the bronchi or lungs.

The course and ultimate fate of a sterile hæmothorax have recently been studied by Tuffier and Miliani¹¹ in a case of shot wound of the chest. Two days after the accident, the effusion was without pneumothorax and not abundant. The blood is supposed to have remained fluid. By the sixteenth day the

amount of effusion was estimated at two and one-half litres, and on the twenty-first day flatness reached in front to a level two finger-breadths below the clavicle. At the time of discharge, signs of fluid still reached three or four finger-breadths above the base of the lung. As a result of their research, they state that the proper treatment of a traumatic hæmothorax is capillary puncture about the fifteenth day, at the time when the dilution of the blood is suitable, and when the pulmonary wound is sufficiently cicatrized to occasion no fear of a new hæmorrhage on account of the removal of the compression of the lung.

When the original effusion of blood is moderate in amount or small, as in their case, a primary operation is hardly indicated unless one takes extreme views, or is controlled by a desire to prevent subsequent infection. But the final result in cases of large hæmothorax is not always quite satisfactory, for recovery takes place slowly, and the lung is somewhat crippled by thickening of the pleura or unabsorbed products of the coagulated blood. Operations on account of the subsequent development of infection in the effused blood are fairly frequent, so that the results are not as satisfactory as the advocates of a do-nothing policy would have one believe.

Klett¹² quotes the very conservative views of Billroth, König, Riedinger, Tilmann, and Langenbeck as to the treatment of penetrating wounds of the thorax. In general they advocate rest, the closure of the wound, cold applications, and compression by bandages, even when pneumothorax or hæmothorax are severe. Klett himself reports thirty-two penetrating stab wounds in which he did twenty-eight "primary disinfections" with recovery. He had twenty smooth healings; pericarditis, pleuritis, and hæmothorax each occurred once; and empyema, for which he operated, five times. He advises primary disinfection, by which he means the excision of the wound layer by layer to and including the pleura or pericardium if injured; and in addition, if necessary, rib resection or removal of fragments of bone. Hæmorrhage is to be stopped, the wound drained and sutured. If the wound is

penetrating, an iodoform gauze tampon or a drainage tube in the pleural cavity also should be used. When he finds hæmothorax present, the blood is allowed to run out or is removed by aspiration. He says that this method controls hæmorrhage, distending pneumothorax and threatening emphysema, and enables one to determine if there is a penetrating wound of the lung or injury to the heart. The pneumothorax from enlarging the wound generally disappears in a few days and the lung expands. The drainage tube when introduced is tied at the outer end so as to cut off the pleural cavity from communication with the outer air. In case of need the ligature is removed from the drainage tube. The tube is removed after a few days (when the lung has had time to expand and, perhaps, to form adhesions to the chest wall) if infection has not occurred. Klett also reports twenty-four gunshot wounds, three of which died. Strangely enough, he does not apply his method of primary disinfection to these cases.

Gross,¹³ also, who reports four cases of penetrating stab wounds, in one of which he opened the pleura for a four-fingers' wide hæmothorax with pneumothorax and turned out the clots, does not advocate interference in penetrating bullet wounds. He reports twelve such cases in which the lung was wounded, and all recovered. In several, however, he "excised the wound," though he did no primary thoracotomy. In a number of them he aspirated bloody fluid after a lapse of some days and did two thoracotomies for infection that developed. At the time of their discharge most of his cases had quite extensive dulness at the base, even when they had been kept as long as ten or twelve weeks under treatment.

What logic there may be in operating on a stab wound with a hæmothorax only three or four fingers wide, but declining to intervene in shot wounds though the hæmothorax fills the pleura as high as the spine of the scapula or is complete, I fail to perceive. Infectious material is as likely to be introduced by the bullet as by the knife, as each must penetrate both clothing and skin; and in the contused wound left by the

bullet, conditions are more favorable for bacterial multiplication than they are in the incised wound.

In civil practice gunshot wounds are still, as a rule, produced by the old-fashioned lead bullet, and produce results unlike those of the modern weapons used in warfare. The range is generally close, and the bullet, though of small calibre, rarely passes out of the body.

Taking Klett's cases and those of Bayer,¹⁴ Klihen,¹⁵ and v. Haselberg¹⁶ collected by him, and the cases of Gross¹² and McCosh,¹⁷ we get 124 cases with thirty-one deaths, a mortality of 25 per cent. in recent cases. But here, again, one must remember that the mere fact of a perforating chest wound is no indication of its gravity. The amount of collapse of the lung and the probability of infection must determine for each case whether to operate at once or not.

The actual mechanical conditions in pneumothorax vary according to the amount and source of the air in the pleura. Air may enter from the lung or a bronchus, the thoracic wall being normal; it may enter through a wound in the chest wall or through both the visceral and parietal pleura. Recently the method of treatment of pulmonary tuberculosis by the introduction of nitrogen gas into the pleura (Murphy, etc.) has given rise to a practically new form of pneumothorax in which there is no appreciable trauma in the lung or chest wall. The lung collapses more or less according to the amount of gas introduced, an amount which can be readily controlled, and which remains unaltered by respiratory movements. Pneumothorax may be due to other causes which it is not necessary to consider here.

In traumatic cases pneumothorax is rarely pure, but the pleural cavity almost always contains some blood. When the wound in the lung is large, subsequent infection of this blood occurs quite often and leads to an operation. In the pathological cases of pneumothorax, also, pyothorax often develops when death does not result from the original distention of the thorax.

When the pleura is normal, pneumothorax soon disap-

pears, the air being often absorbed in a few hours, or in from one to three days, if it is present in large amount. Nitrogen is said to remain longer, so that the injections require to be repeated only at intervals of about four weeks (Murphy, Loomis¹⁸).

The normal pressure within the pleura is negative. When air is introduced into a closed pleural cavity, four pressure changes may occur. (1) The pressure may still remain negative if the quantity of air admitted is small enough. (2) There may be just enough air to balance the original negative pressure. In these two cases the lung will still expand and collapse with the respiratory movements of the diaphragm and chest wall and continue its functions. Enough air may be admitted to make the pressure within the pleura positive. (3) When this positive pressure is extreme, the lung collapses completely and is subjected to compression, the diaphragm is pushed downward, the mediastinum to the opposite side, and the thorax on the affected side is less mobile and of increased circumference. Neither expiration nor inspiration cause any expansion of the lung on the affected side. The respiratory function is carried on entirely by one lung working at a disadvantage, and serious circulatory disturbances result from pressure on the blood-vessels or kinking of them. (4) When positive intrapleural pressure is less extreme, the lung on the affected side is ineffectively controlled by the thoracic wall. It may collapse during inspiration and expand during expiration, so that, while air enters it, this air is not fresh, but that which has already been used by the other lung; the volume of air passing through the trachea is diminished; and as the sound lung is imperfectly ventilated, cyanosis can develop; or the lung on the affected side may still participate in respiration to a certain extent.

When the thorax is opened widely air will enter until the intrapleural pressure is equal to that of the external air; but pressure will vary with each respiratory act more or less rapidly according to the size of the opening; so that any of

the four pressure relations may succeed each other in the same case with different phases of the respiratory act.

With a widely open thorax, collapse of the lung is said to be complete after about five expirations. The inflow and outflow of air at each quiet respiration is given at 500 cubic centimetres, and the lungs are said to contain about 2800 cubic centimetres of air after quiet respiration.

It is important to bear in mind that lesions of the chest wall permit air to enter the pleura during inspiration, but air from the bronchi or lungs enters the pleura during expiration. When air comes from the latter source, a valve action may prevent its exit when the intrabronchial pressure falls during expiration. Air may then accumulate in the pleura, and under a pressure as great as that in the trachea during forced expiration or coughing.

Fatal distending pneumothorax can occur even when the opening in the lung is very small, as in a case reported by Hodenpyl.¹⁹ The patient, while at work, had been suddenly seized with severe pain and died in a few hours. The lung was collapsed, the diaphragm bulged downward, and the liver had been forced almost entirely below the free border of the ribs. The opening was so minute as to be discoverable only after forcing air through the bronchi.

A distending pneumothorax from a wound of the chest wall must occur very rarely if the lung or visceral pleura is uninjured, although very sudden and forcible inspiratory efforts may cause it when there is a valve action of the wound. It is hard to conceive of its becoming as complete and dangerous as the pneumothorax from lung wounds.

The importance of pneumothorax is due to the collapse of the lung which occurs with it, to the circulatory disturbances, and to the greater likelihood of infection when it has been present.

Gross says that the same phenomena that occur in pneumothorax follow the sudden rupture into the thorax of a large subphrenic abscess, echinococcus cyst, or abscess of the liver.

Hellin²⁰ collected the various views held as to the occur-

rence of complete collapse of the lungs in pneumothorax, and reports five sets of experiments which he performed.

The opinions are as follows:

(1) The lung collapses completely even with the smallest opening in the thorax (König).

(2) The size of the aperture affects only the rapidity with which the lung collapses (Skoda), but the difference is one of at most only eight respirations (Reineboth).

(3) The lung collapses only when there is a rather large opening in the pleura (Patrick Fraser).

(4) The lung collapses only when the opening in the pleura is larger than the cross section of the trachea (Gerulanos).

(5) Complete collapse of the lung depends on the position of the opening in the pleural cavity (Smith).

(6) The lung does not collapse completely, for changes of pressure persist in the collapsed lung (Thoma, Aron, Weil).

(7) The lung does not collapse completely; there are movements after the pleura is opened; but these movements do not pump air into the lung (König, Rosenthal, and others).

He performed five groups of experiments.

I.—Double pneumothorax was produced slowly (five minutes) in rabbits by a small needle or glass tube two millimetres in diameter. There was no bad result except dyspnœa, and this disappeared after four hours. On the second day, a cannula five millimetres in diameter was inserted for one hour. The only result was dyspnœa, which disappeared after a few hours.

II.—Double pneumothorax was produced first on one side by a large opening about three-fourths of a centimetre square, one or two ribs being excised several times. In one or two minutes the opening was closed by suture, and then the other side opened in the same way. Several animals lived six weeks after this operation.

III.—Both pleural cavities were opened simultaneously (two ribs being excised) for a minute or a minute and a half. The wounds were then sutured. The animals lived from half an hour to an hour and a half.

IV.—Both sides were opened simultaneously and left open. The animals lived five or six minutes. He attributes the death to great cooling and evaporation, with irritation of the terminations of the vagi, and to kinking of the vessels.

V.—He extirpated the right lung. After six days the left pleural cavity was opened, first by a fine cannula, then by resection of two ribs, and kept open five minutes. The wound was then sutured. The animal died six weeks later.

Amburger²¹ has collected sixty-eight cases in which the pleura or pericardium was opened during operations for the removal of tumors of the thoracic wall. The occurrence of pneumothorax during such operations has such formidable sequelæ in many cases that a great deal of attention has been paid to preventing it or combating its results. If the opening is small and closed at once there is no danger. When no pleuritic adhesions exist, and the defect in the chest wall is larger than a bronchus, dyspnœa, cyanosis, and collapse of the lung threaten. This is attributed to reflex action from irritation of the vagus (Maas, Tietze), or to the direct result of the suddenly changed intrathoracic mechanical conditions (Witzel). The condition is more dangerous when the opening is maintained long, and if the wound is situated on the right side. Some regard cooling and water evaporation as essential factors (Maas, Kolaczek, Weinlechner), others the arrest of blood in the non-collapsed lung.

To prevent the occurrence of collapse of the lung in thoracotomies, or to treat it, a number of procedures have been proposed or employed, namely,—

(1) To inject a certain amount of sterile water or air before the operation;

(2) To prevent evaporation by operating under a spray;

(3) To let the air in slowly through a small opening at first;

(4) To keep the wound open as short a time as possible;

(5) To tampon the wound in the pleura with gauze, so that its lumen will be smaller;

(6) To hold the pleura with the finger;

(7) To suture the pleura to the chest wall (pneumopexie);

(8) To convert the pneumothorax into hydrothorax, and aspirate;

(9) To increase the intrapulmonary pressure by inflation, through masks, after tracheotomy, or by the Fell-O'Dwyer apparatus.

When the thoracic wound is closed after having been open

but a short time, the threatening symptoms rapidly disappear. This happy result cannot be due to the immediate and complete absorption of the air in the pleura, but rather to such an adjustment of pressure relations as permits the lung on the injured side to resume its respiratory function at least partially. Cyanosis and dyspnœa must continue as long as one lung, contracting and expanding like the reservoir in some ether inhalers, prevents the sound lung from getting an adequate supply of fresh air. The lung on the injured side cannot act in this harmful way when it is adherent to the chest wall, or consolidated, or has a much thickened pleura, or when the intrapleural pressure is such as to allow the thoracic movements to control those of the lung. When we open the thorax for empyema, the thickened pleura prevents this lung from ballooning; and such an action may be prevented by packing against it a sufficient amount of gauze. The sound lung can then get enough air to maintain the aëration of the blood. But the lung on the injured side takes no part in respiration. Preventing its collapse is better than preventing its expansion, for the lung can perform some of its function. The Fell-O'Dwyer apparatus restores the use of two lungs to the economy. But the Fell-O'Dwyer apparatus cannot be used in cases where the thoracic wound is to be closed if there is an unsutured wound of the visceral pleura.

The question has arisen as to whether hæmorrhage into the pleura is more apt to be arrested when the pleural cavity contains air or blood. When pleural distention by either air or fluid is complete, movement of the lung will be arrested. But when only a moderate amount of either is present in the pleura, the thoracic movements will be conveyed to the lung less by air than by the non-elastic fluid. On the other hand, the sound lung can more readily distend the collapsed lung, and thus use it as a cut-off reservoir to the disadvantage of the aëration of the blood, if air and not water or other incompressible medium surrounds it.

It is stated that the formation of a blood-clot occurs more readily in the presence of air than of fluid. The precise con-

ditions under which air or fluid may be the better agent for arresting intrapleural hæmorrhage are not yet clear.

The methods used to arrest hæmorrhage from the lung after thoracotomy have been

Tying the bleeding surface and cutting off the lung below the pedicle (Omboni) ;

Suture (Delorme and Robert, Ferraresi, Turetta) ;

Packing the wound with gauze (Michaux, Quénu, Da Costa, Gallaudet, Annequin) ;

Packing the pleura to support the lung, and then packing the wound in the lung with gauze (Da Costa, Kopfstein) ;

Costopneumopexy is suggested by Matas and Tuffier.

In his successful thoracotomy for stab wound, already referred to, Gross did not suture the wounded and collapsed lung, but after turning out the clots from the pleura he closed the wound in the chest wall with a tight bandage. In ten days the case was dismissed cured.

In spite of the dangers from opening both sides of the thorax simultaneously, occasionally in double empyema both sides have been operated on at once by thoracotomy. Two such instances with recovery are reported.^{22 23} Pollard²⁴ had a recovery in a child with normal pleura in which both pleura were accidentally opened by a fall on the spikes of a fence. He excised the edges of the wounds in succession while preventing the entrance of any more air into the pleura.

The wound in the pleura has been closed without drainage, or in supposedly infected cases drainage has been arranged for through a partially closed wound ; or the wound has been closed and drainage made at a more suitable part of the thorax.

The pleura when closed has been filled with salt solution or left full of air.

Kopfstein²⁵ reports operations in two cases of injury to the lungs by the ribs with recovery. In the first he resected sharp fragments of ribs and replaced the lacerated lung. He sutured the skin wound, and later operated on a secondary abscess.

In the second case he removed a piece of rib twenty-five centimetres long from the lung in which it was embedded.

There was an enormous emphysema. He made a large flap, and found the fourth rib missing from the thoracic wall, but embedded in the lung, where one end had punctured the pericardium. He tamponed the wounds of lung and pericardium and the entire chest.

Fontan's case is the most ideally successful of any reported. For a stab wound penetrating the pleura, lung, pericardium, heart, and injuring the diaphragm, he exposed the pleural cavity by a large flap containing the fourth, fifth, and sixth ribs on the left side. He sutured with catgut the wounds in the diaphragm, lung, and pericardium, as well as one of the heart three or four centimetres from the apex. The pleura was closed after cleansing it, and primary union resulted.

When largely open thoracic wounds with external hæmorrhage occur, there is no question that one will attempt to arrest the hæmorrhage. But it seems equally clear that when an internal hæmorrhage from any source threatens life, an attempt should be made to arrest it, and that extensive pneumothorax should never be allowed to cause death from suffocation without interference.

Operative interference is not only justifiable, but imperatively called for

(1) In distending pneumothorax from whatever cause. If aspiration or the introduction of a trocar does not give relief, thoracotomy should be done, and the lesions thus ascertained treated in appropriate ways;

(2) In large hæmothorax in cases of fractured ribs, contusions of the thorax without external wound, and penetrating wounds of the thorax without regard to the nature of the weapon producing the injury;

(3) In extensive and progressive subcutaneous emphysema after thoracic injuries.

The nature and extent of the measures to be resorted to must be determined according to the needs of the particular case.

Exploratory operations may be proper in order to determine whether wounds in the lower part of the thorax

have penetrated the diaphragm or peritoneum; or to satisfy one's self as to the integrity of the heart or pericardium as well as of the internal mammary or intercostal arteries; or to provide proper drainage in wounds where infection is suspected.

Delorme pointed out that in penetrating wounds with pneumothorax or hæmothorax the fear of causing collapse of the lung is baseless, as the collapse has already occurred.

We have at hand valuable and trustworthy means of combating shock and loss of blood in the intravenous or subcutaneous injection of hot salt solution. Oxygen inhalations and strychnine are also of great value in improving the circulation and respiration.

The surgeon who hesitates to open the pleura in traumatic cases for fear that he may infect should promptly improve his methods. He who can open the peritoneum or meninges safely need have no fear of infecting the pleura.

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FRACTURE OF THE CARPAL SCAPHOID WITH DISLOCATION FORWARD OF THE CENTRAL FRAGMENT.¹

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IN the second week of the month of November, two patients were admitted to the Hudson Street Hospital with an injury which I had never before encountered or seen mentioned. It was fracture of the carpal scaphoid with dislocation forward of the central fragment.

The first patient, a man forty-six years of age, had fallen from the fourth floor of a building in process of construction, receiving a fracture of the thigh in addition to the injury of the right wrist. The latter injury was marked by a bony prominence easily felt and movable under the skin in the middle of the anterior surface of the wrist. The fingers could be actively flexed and extended with only slight pain. The patient could give no account of the manner in which the injury had been caused. The appearances were so similar to those of the three cases of anterior dislocation of the semilunar bone which I had seen, and the dislocation of that bone is so very much more common than that of the other carpal bones, that I deemed this to be another case of that kind, and proceeded at once to the removal of the dislocated bone, after having taken an X-ray photograph, but before having developed it. The fragment was found lying immediately under the skin, completely detached, and was removed.

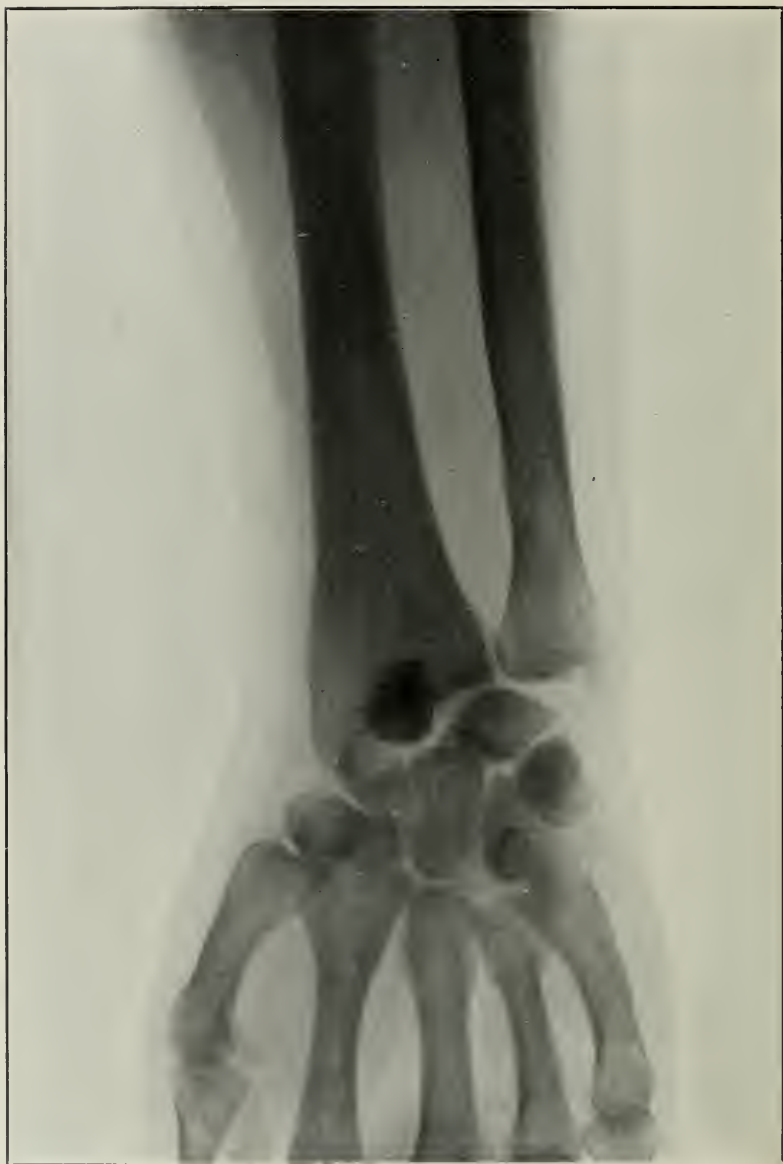
The wound, longitudinal on the ulnar side of the flexor

¹ Read at the meeting of the New York Surgical Society, December 11, 1901.

Fracture dislocation of carpal scaphoid, lateral view. Case I.



Fracture dislocation of carpal scaphoid, anteroposterior view. Case I.



tendons, healed without incident, and the patient is now, a month later, able to make light use of the hand with fairly free mobility in the joint. The bone proved to be the half of the scaphoid which adjoins the os magnum and semilunaris, the line of fracture crossing the bone just within the outer edge of the articulating surface corresponding to the os magnum.

The second patient, a man twenty-six years of age, received his injury by a fall from a height of three feet, in which his left wrist was forcibly bent in palmar flexion against his side. He was treated as an out-patient, and I did not see him until a fortnight after the accident. The left wrist was then slightly swollen and distinctly deformed on the radial side, the deformity consisting in a projection forward of the radial portion of the carpus, and a slight deviation of the hand and wrist towards the radial side, which increased the normal prominence of the lower end of the ulna, as shown in the photograph. When the injury was recent, crepitation was plainly felt on manipulation. When I saw him the parts were so tender that a thorough examination could not be made, the tenderness being very marked over and about the scaphoid. Under anaesthesia, some details could be made out: the lower end of the radius was uninjured; its posterior articular border could be readily palpated because of the depression below it produced by the forward displacement of that portion of the carpus, and a resistant mass could be felt below the outer half of its anterior border; the carpus could be moved backward and forward on the radius with marked crepitation.

An incision three inches long was made along the outer border of the palmar surface of the wrist and adjoining portion of the forearm, and deepened until the radiocarpal joint was opened, exposing a fractured surface of bone directed forward. This proved to be the central portion of the broken scaphoid. Although I was able to rotate it so that the fractured surface was in its proper place, I could not bring it into easy and stable contact with the corresponding surface of the other fragment, and therefore severed its remaining attachments to the semilunar and removed it. It was evident that the relations between some of the other carpal bones were somewhat altered, and this was apparently the reason why the fragment could not be restored to its place. The line of fracture corresponded to that of the first case, but was a little nearer the central end of the bone.

The patient made an uneventful recovery, but the range of motion in the wrist is still restricted, and an abnormal prominence can be felt in front just above the radiocarpal line.

I find reported in periodical literature three cases in which the scaphoid has been broken, and one of the fragments dislocated. Auvray (*Gazette des Hôpitaux*, 1898, p. 377) reports one observed by Pelvet. The injury was caused by a fall from a height, which led to the patient's death a fortnight later. The fragment (he does not say which) was displaced backward. He quotes a similar case (Fortunet, in the *Traité de Chirurgie* of Le Dentu and Delbet) in which the fragment is said to have been the central portion of the bone, that adjoining the semilunar, and was also displaced backward; the injury was caused by a fall from a height, and death was immediate.

In the third case (Forgue, *Gazette hebdom. de Montpellier*, 1887, No. 1) there was a compound dislocation forward of the semilunar and the adjoining portion of the scaphoid.

In connection with these, as possibly bearing upon the mode of production, may be considered a case reported by me to this Society in 1891, and one reported by Steffel in *Langenbeck's Archiv*, vol. lxiii, Part I, in both of which the semilunar and a portion of the scaphoid were together detached from the remainder of the carpus. In my case they remained attached to the radius, while the entire portion of the remainder of the carpus was widely displaced backward; in Steffel's case they were dislocated forward. In my case the conditions were shown by autopsy; in Steffel's by the X-rays.

A number of cases, perhaps a dozen, of fracture of the scaphoid without dislocation have been reported, some verified by autopsy, but without definite indications of the mode of production. In a few of them coincident fracture of the radius existed, making it probable that the cause was violence, received in a fall upon the palm of the hand, acting upon the scaphoid through the trapezium. It is to be borne in mind that



Fracture dislocation of carpal scaphoid, anteroposterior view. Case II.



Fracture dislocation of carpal scaphoid, lateral view. Case II.

dorsal flexion of the wrist takes place largely in the medio-carpal articulation, and that the scaphoid only rotates in place upon the radius. Attempts that have been made to produce the fracture experimentally by forced dorsal or palmar flexion have produced only partial fractures at the points of attachment of the ligaments; and, although fracture has been effected by a blow upon a small iron rod placed directly against the scaphoid in front or behind, it seems unlikely that such conditions have acted in any of the cases observed. The position and direction of the line of fracture in my two cases, which is apparently the same as that in the three cases of backward dislocation and the one of forward dislocation in connection with the semilunar above quoted, combined with the fact of dislocation, suggests a fracture by avulsion and cross strain; the dislocation in my cases being subsequently effected by the pressure of the head of the os magnum upon the central fragment, which was then restrained only by the ligament binding it to the semilunar.

The restoration of function in the first case is gratifying; in the second the limitation is probably due to the uncorrected derangement of the relations of the remaining bones. An additional reason for removing the fragment in the second case was that in three old cases of simple fracture of the scaphoid which have come under my observation the loss of motion in the wrist was complete.

TREATMENT OF DISLOCATION OF THE CLAVICLE THROUGH OPEN WOUND.¹

By JAMES E. MOORE, M.D.,

OF MINNEAPOLIS.

ABOUT two years ago I treated a railway passenger conductor for a fracture of the clavicle and a dislocation upward of the outer end of the same bone. The union of the fracture was excellent, showing that the parts were well held by the dressings, but the result from the dislocation was very bad. The bone stands out so prominent that it can be felt through the clothing, and the patient tells me that he can no longer help the baggage-man handle trunks as he was accustomed to do when they were in a hurry, because that shoulder is weak and becomes painful when he attempts to lift a heavy weight.

The fact that this is the usual result following this accident when treated by bandages, adhesive straps, or plaster of Paris, affords the conscientious surgeon but little consolation. Some recent writers have advocated treatment of this dislocation by wire suture, but I have been unable to find any literature upon the subject. Quite recently I have treated a case by cutting down upon the dislocated bone, replacing it and the surrounding soft parts, and fastening them there by means of silver wire and catgut sutures. The result is so satisfactory and the findings were so instructive to me that I thought the case worthy of publication.

The patient, L. M., aged eighteen years, was referred to me on September 17, 1901, by Dr. Orton, of Minneapolis. He was a member of the high-school football team, and on that day,

¹Read before the Western Surgical and Gynæcological Society at Chicago, December 18, 1901.



FIG. 1.—Upward dislocation of acromial end of clavicle.



FIG. 3.—Result obtained by exposure and suture of dislocation of acromial end of the clavicle.

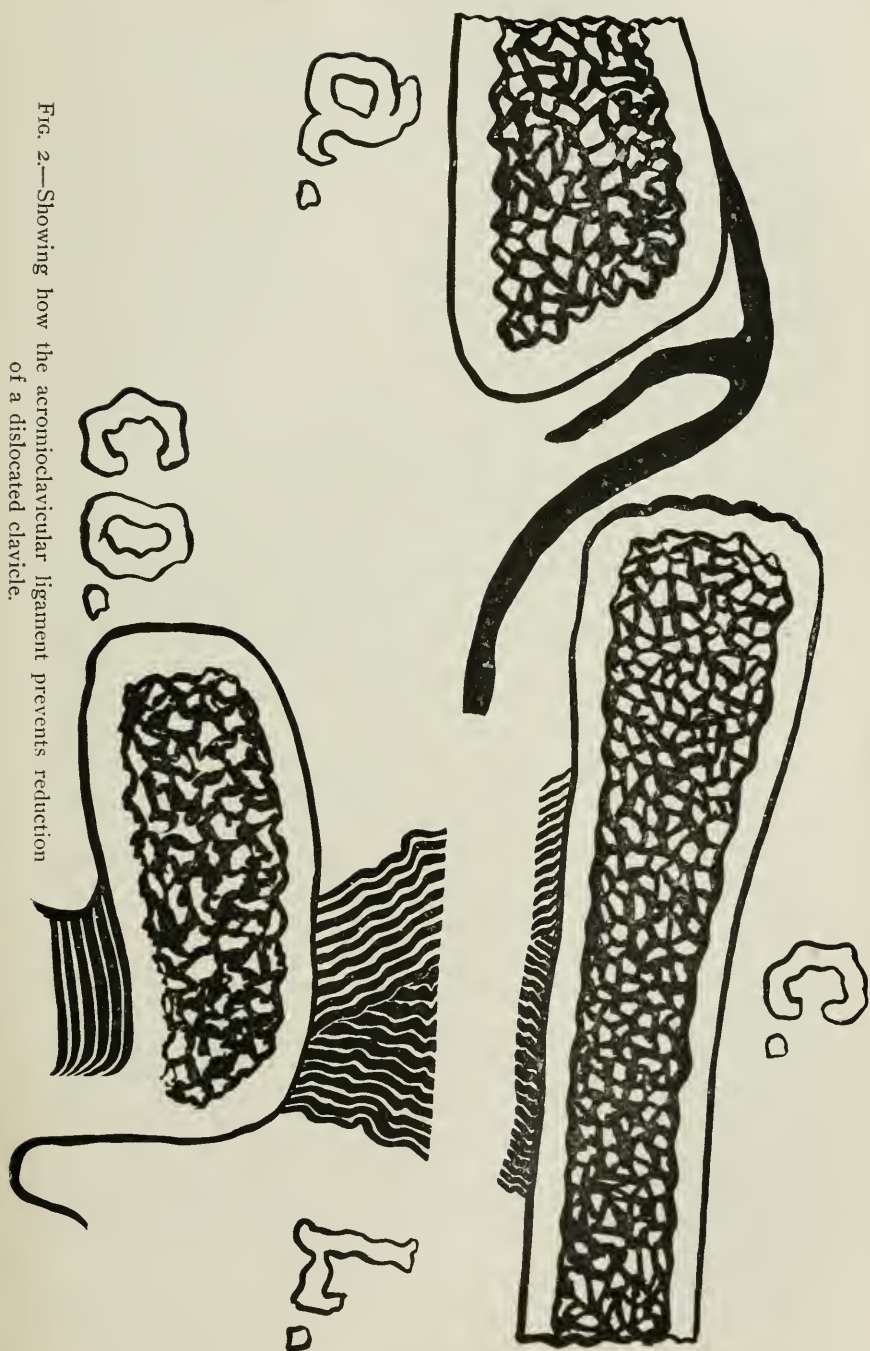


FIG. 2.—Showing how the acromioclavicular ligament prevents reduction of a dislocated clavicle.

when "diving in," had sustained an upward dislocation of the outer end of the right clavicle. The diagnosis was self-evident. (Fig. 1.)

By laying him on his back upon a hard table, so that the scapula was tilted outward and backward, the dislocation could be readily reduced. An attempt was made for three days to hold the bone in place by means of adhesive straps and bandages, but every time he returned to my office it was found out of place. It seemed wrong that this young man, who took special pride in his physical development, should be condemned to permanent deformity and partial disability, so an operation was advised, which he promptly accepted.

On September 29, 1901, at the Northwestern Hospital, an incision about four inches long was made around the outer end and upper posterior border of the clavicle extending down through the soft parts to the bone. Although there was no abrasion or discoloration of the skin, it was very evident that the dislocation had very nearly been compound, for the outer three-fourths of the clavicle were completely separated from the soft parts. The coracoclavicular ligaments were completely torn across. (Fig. 2, L.) The acromioclavicular ligaments were left attached to the scapula, leaving the end of the clavicle quite bare. A finger could be passed underneath the clavicle almost to the sternum without meeting with any obstruction. It was now very easy to understand why the clavicle would not remain in its place when it seemingly had been reduced. The fact is, that it had never been reduced, and it was necessary to cut the superior acromioclavicular ligament quite extensively before the reduction could be made. When reduction was supposed to have been accomplished before the operation, it is evident that the acromioclavicular ligaments had been pushed down by the clavicle, so that nothing remained above to hold the bone in place but the skin and superficial fascia. (Fig. 2, C.) This explains our failure in treating these cases by ordinary means. One can understand that in a case where the injury was not so severe as in this case the clavicle might not be lifted above the acromioclavicular ligament, and might be completely reduced with a hope of retaining it there; but it is very evident that after a complete dislocation complete reduction and retention are impossible save through an open wound.

Three holes were drilled through the upper margin of the outer end of the clavicle and corresponding ones through the acromion process. The bone was then placed in its normal position and held there by silver sutures passed through these holes. The superior acromioclavicular ligament was replaced and the ends united by catgut sutures. The superficial fascia and integument were united by catgut and silk respectively, and a surgical dressing applied. As an extra precaution, the patient was kept in bed and on his back for three weeks. At the end of five weeks the wire sutures, which were necessarily quite superficial, were showing through the skin, and were removed. One week later the condition of the shoulder was perfect, as shown in Fig. 3, and it has remained so ever since.

One of the theoretical objections to wiring in these cases that has doubtless arisen in the mind of every surgeon who has ever contemplated the operation, is that this being a moving point the wires must sooner or later be a source of irritation; and it seems to be well founded. Should I ever again have an opportunity to perform this operation, I shall use chromicized kangaroo tendon, because it is strong, elastic, and sufficiently durable.

SUBCUTANEOUS INJURY OF THE BRACHIAL PLEXUS.¹

BY PERCIVAL R. BOLTON, M.D.,

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Two cases of total brachial plexus paralysis have recently been observed in the New York Hospital, one in the service of Dr. Frank Hartley, the other in my own, which are almost unique.

I.—Dr. Hartley's case. Male, aged twenty-seven years; Norway; laborer. Five weeks anterior to operation the patient fell four stories and sustained concussion of the brain and fracture of the right patella. Paralysis of the left arm was present immediately after the injury, and persisted unchanged. At the time of operation there was motor paralysis of all of the muscles of the arm and shoulder, and sensory paralysis below the insertion of the deltoid, except a small area over the postero-internal surface of the upper part of the arm.

The reaction of degeneration was present in all of the paralyzed muscles, which were somewhat atrophied.

Operation.—An incision was carried from a point two inches below the mastoid process downward along the anterior margin of the sternomastoid to the sternoclavicular joint, thence outward over the clavicle to its centre. The flap so formed was reflected, the incision then carried vertically downward for four inches, the clavicle divided, and the ends pulled down. The situation of the plexus was thus exposed, but instead of the brachial plexus a mass of granulation tissue of some density presented, into which the upper and middle cords could be traced, and in part through it, behind which there was a nest of loose fibrils considered to be sheaths of the degenerated nerves.

¹ Read before the New York Surgical Society, October 9, 1901.

Removal of this granulation tissue would have left the nerve ends so widely separated that suture could not have been accomplished, so the wound was closed and healed without incident.

II.—Male, aged forty-nine years; United States; laborer. About nine months before operation the patient was run into by a locomotive. The right humerus was fractured about its middle, and was immobilized for thirteen weeks. On removal of the dressing, if not before, total paralysis of the arm and shoulder was found to exist, and persists unchanged. On admission there was marked atrophy and complete paralysis of all of the muscles supplied by the brachial plexus. Reaction of degeneration was present. There was sensory paralysis below a line drawn circularly about the arm just above the elbow, above which sensibility seemed normal.

Operation.—An incision was made from a point three inches below the mastoid process downward over the sternomastoid, crossing the clavicle external to the sternoclavicular joint, thence outward slightly below the level of the clavicle to a little beyond its middle. The flap so formed was reflected, the clavicle divided obliquely from above down and outward, the ends depressed, and the subclavian triangle cleared, when the following condition was disclosed. There was a band of dense cicatricial tissue two and a half inches in width, extending outward from the outer surface of the scalenus anticus, with which it was fused, parallel with and adherent to the third part of the subclavian and axillary arteries, finally disappearing beneath the outer part of the divided clavicle. Not one of the cords or branches of the brachial plexus was to be seen, although the emerging branches of the upper cervical nerves were easily recognized above the mass.

Neither the suprascapular nor the transversalis colli arteries were identified, though veins were encountered in the positions usually occupied by these vessels.

It was obvious that no successful excision of the scar tissue and suture of nerve could be carried out, so the wound was closed and healed without incident. Masses of small size were removed from the cicatrix in both cases, and were found to contain numerous nerve fibres.

The lesion in both of these cases consisted in the inclusion of the cords of the plexus in granulation tissue, the latter

then becoming cicatricial tissue and associated with this, and possibly due to the increased compression to which the nerves were subjected, degeneration of them and their probable permanent cessation of function. The origin of the scar tissue can only be conjectured, but a case which recently came under my care may be cited as demonstrating at least one source of cicatricial tissue in this region.

The patient referred to received a stab wound at the base of the left side of the neck, dividing the outer cord of the plexus and opening the subclavian (or axillary) vein; hæmorrhage was profuse, and a considerable hæmatoma was formed in the lower part of the neck. It seemed prudent to await the absorption of the extravasated blood before attempting to suture the divided nerve, and it was four or five weeks before this was carried out. Then a condition not unlike those described was found; the subclavian triangle was occupied by a considerable amount of cicatricial tissue. So that it may fairly be concluded that hæmatomata in this position may, as in other situations, be replaced by new-formed tissue,—so-called organization of blood-clot.

The mechanism by which blood-vessels of any magnitude can be torn at the root of the neck by indirect violence is not so easy to determine; but in my case, at least, the two arteries ordinarily met were either absent or very slightly developed.

Another theory would ascribe the injury of the plexus to a crush of its cords against the first rib by the clavicle consequent upon violence carrying the shoulder downward and backward, but, judging from the longitudinal extent of the lesion, this did not occur in the cases reported.

It is obvious enough that no suturing operation after extirpation of the scar tissue could have been carried out; and although the tissue examined was found to contain nerve fibres, the considerable period—nine months—which had elapsed between the date of injury and that of examination in the second case makes the likelihood of spontaneous cure im-

probable. The patient thus has an arm that is uncontrollable, flaccid, and insensitive; it is therefore useless, and may be the site of dangerous injuries or infections, so that its removal seems indicated after a sufficient time shall have passed to preclude the possibility of spontaneous recovery.

CHRONIC PHAGEDÆNA DUE TO MIXED INFECTION.¹

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HISTORY OF CASE BY DR. LOUX.—J. B. McC.; aged twenty-five years; occupation, dentist; nativity, England.

Family History.—One sister died at the age of nineteen from diabetes; father is suffering from gall-stones; other than this the family history is negative.

Personal History.—Patient denied ever having chancre or chancroid. He states that at the age of sixteen years he contracted gonorrhœa, which was followed by stricture, and was treated by gradual dilatation. There was a tendency to recontract (apparently from the history of the case of resilient stricture), so much so that the patient was trained to pass his own instrument, and was instructed to do so, with the view of preventing a stricture of small calibre. He further states that there was ever present at the meatus a slight discharge of a mucopurulent character, and, as the discharge had never been examined microscopically, its character and the contained flora are not known.

Whenever the patient indulged freely in the use of alcoholic liquors, he would suffer with retention of urine, requiring catheterization.

¹ From the Laboratories of the Jefferson Medical College Hospital.
Read before the Philadelphia Academy of Surgery, December 2, 1901.

Present History.—In January, 1901, after a night's debauch (followed by retention of urine), the patient attempted to catheterize himself, using considerable force. In the attempt he broke the catheter about one inch behind the meatus, causing a free hæmorrhage. Following this trauma to the urethra (discovered two weeks afterwards), a hard induration on the floor of the urethra appeared one inch behind the meatus; the nodule rapidly increased in size. It developed into a periurethral abscess, rupturing externally. He now consulted a surgeon, who incised the abscess freely, followed by irrigation and the usual antiseptic precautions. He further states that under this careful treatment he noticed a rapid destruction of the surrounding parts and a communication into the urethra. He was then advised to remain in the hospital, but this he refused to do.

I saw the case in consultation for the first time on February 20, 1901. The tissue on the under surface of the penis (from the frænum back one and a half inches) was destroyed apparently through a phagedænic process, involving the skin, subcutaneous tissue, and floor of urethra, including the corpus spongiosum; the skin showed the greatest resistance to the necrotic process, since the destruction extended well underneath the overlying skin, which was irregular along the edges.

The base of the diseased area was markedly indurated, not limited, but was gradually lost in the surrounding tissues, resembling the œdematous infiltration of chancroid.

On examining the urethra I found two strictures,—the first was a filiform stricture about three and a half inches from the meatus, and the second was at the bulbomembranous junction.

On March 6 I operated upon the strictures, doing an internal urethrotomy on the anterior stricture and a modified rapid dilatation on the posterior one, with continuous drainage of the bladder with a soft catheter. At the same time I curetted the necrotic area, cutting away the diseased overlying edges of skin, followed by a free application of carbolic acid to the diseased surface. Unfortunately, this did not control the phagedæna. I then decided to drain the bladder through the perineum, using a Watson tube, and attempted a plastic operation on the penis, which was done a few days after the perineal drainage was established. The plastic operation was done with great precaution, first cauterizing the surface of the ulcer, which was then removed,

including the adjacent induration; a second set of instruments was used for the plastic work, which consisted in making a new urethra and covering the same and adjacent denuded area with skin flaps taken from the side of the penis. The operation was followed by primary union. The perineal tube was removed, the sinus closed, and the patient was discharged from the hospital April 2 as cured.

On April 25 the patient returned to my office with a recurrence in the right skin flap at the junction of the glans penis. The patient was placed in the hospital, and the ulcer excised by an elliptical incision, including a portion of the corona of the glans penis; the edges were brought together with a few stitches, followed by primary union. At the same time it was noticed that the corresponding left skin flap was becoming indurated, with a tendency to break down along the edges. So rapid was the destruction of the skin and deeper structures that any further operative procedure was abandoned.

An attempt was now made to control the phagedæna with the Paquelin cautery, but without any result. We then tried an application of formalin, 20 per cent. solution, which seemed to check for a short period the rapid progress of the disease. New areas then became involved; there was already much of the penis destroyed, as shown by the plate (Fig. 1), and we decided to amputate the penis at the penoscrotal junction. After his return to the hospital, it was noticed that one superficial inguinal gland on the right side was enlarged about the size of a hazel-nut; this gland showed a tendency to break down.

On September 6 the amputation of the penis was performed, and at the same time the broken-down gland of the right groin was removed; both wounds recovered primarily. There has been no recurrence of the disease to the stump of penis, but a marked recurrence in the right groin, destroying skin and superficial tissue about three and a half inches long and two inches wide. On November 6 the ulcerated area was thoroughly curetted, the diseased areas of the skin cut away, and the entire surface of the ulcer wiped out with pure nitric acid. The wound granulated, and the patient was discharged from the hospital on November 30 as cured.

PATHOLOGIC REPORT BY DR. COPLIN.—The first material for examination in this case consisted of "A," Inoculations on vari-



FIG. 1.—Phagedæna of the Penis. Photograph before operation. (Case reported by Dr. Loux and Dr. Coplin.) A, Hæmostat by which organ is extended. B, Fibrous septum marking superior margin of corpus spongiosum. Just below the leader from B is seen the necrosing end of the spongy body. C, The undermining extended down to about this line; at points, *e.g.*, around the urethra, the subcutaneous necrosis extended somewhat deeper. From C to D is the zone of induration. The amputation line was about the point marked by the leader from D.

ous media; "B," Material for spreads; "C," Fragment of tissue; all from penis.

The following is a summary of the result of the examination made by Dr. R. C. Rosenberger:

"A." Inoculations were made from the material upon glucose agar, bouillon, and liquid blood serum. Incubated for forty-eight hours, a growth was demonstrable in the glucose and urine agar. After incubation for this period, cultures were made and placed in an anaërobic condition. These cultures may be dismissed at this point, as they yielded no information not obtained by the aërobic method.

Upon urine agar there developed small, pinhead-sized colonies, yellowish in color, granular in appearance, and more or less discrete.

Spreads made from these growths and stained by the ordinary methods contain cocci .9 micron in diameter, occurring in pairs, grouped and ungrouped. Some of the pairs consist of cocci with flattened sides in apposition. They retain the dye when treated by Gram's method.

In glucose agar the growth follows the stab, and is also seen upon the surface; it is of a golden yellow color.

Spreads made and stained by ordinary methods show the same organisms described above as found in urine agar, and possessing the same morphologic and tinctorial properties.

The tubes of bouillon and serum showed a growth in seventy-two hours. Each medium was clouded, and a delicate, easily broken-up pellicle formed upon the surface.

Spreads were made and stained by ordinary methods. Upon microscopic examination two organisms were seen,—a bacillus and a coccus. The bacillus was slender, 1 micron to 3 microns in length, and .4 micron in thickness, and occurred in groups, short filaments, and ungrouped. It decolorized when treated by Gram's method.

The coccus measured .9 micron in diameter, occurring in small groups and presenting the morphologic and tinctorial characters of the staphylococci of suppuration. Plates were made, and after isolation of the organisms the bacillus was inoculated into milk, gelatin, and upon potato and other test media. Upon these different media the bacillus yielded the reactions common to organisms of the colon group,—generating a small quantity of

gas, turning blue litmus red, growing with a brownish color upon potato, etc. The coccus is evidently the *Micrococcus pyogenes aureus*.

Inoculations from fresh material were also made subcutaneously into the ears of a rabbit. In seventy-two hours there was noticed swelling and redness around the site of inoculation, followed by pus formation.

Inoculations made upon plain and glycerin agar from the pus showed in forty-eight hours a pure culture of the *Micrococcus pyogenes aureus*.

Spreads made from the pus and stained by ordinary methods for bacteria contain a few polynuclear leucocytes, granular detritus, and shreds of fibrin. A few micrococci are seen, .9 micron in diameter, occurring principally ungrouped and retaining the stain when treated by Gram's method. No bacilli were demonstrable.

In six days the inflammation in the inoculated ear subsided, and since that time the animal has remained apparently healthy.

"B." Spreads made and stained by ordinary methods show numerous polymorphonuclear leucocytes and a few lymphocytes. Numerous cocci are seen, some of which are .9 micron in diameter, occurring in small groups, but mostly ungrouped. A few are found within the cells; they retain the dye when treated by Gram's method. An occasional bacillus is seen which measures 3 microns to 4 microns in length, with rounded ends and occurring extracellular. The cocci resemble the micrococci of suppuration. The bacillus was not obtained in culture, but from its morphology resembles the *Bacillus subtilis*, probably a contaminating organism, and having no bearing upon the suppurative process.

"C." The specimen consists of a small, irregular wedge-shaped mass of tissue, .7 centimetre in its greatest, .5 centimetre in its shortest diameter, and .3 centimetre in thickness. It is of a pinkish color and the surfaces are irregular and rough.

Specimen was fixed in a saturated alcoholic solution of bichloride of mercury, and embedded in paraffin; sections were cut and stained by the usual laboratory methods.

Histologic Examinations.—One surface of the section is nearly covered by stratified squamous epithelial cells. In the middle portion of the surface the epithelial cells have entirely disappeared, or rather been converted into a mass of necrotic and

richly granular *débris*. Beneath the necrotic surface a moderate degree of tissue reaction is present. The cells found here are for the most part polynuclear leucocytes, although lymphoid and spindle-shaped cells are also present in abundance. A few mast-cells are also noticeable in the sections stained with toluidin blue. Beneath the surface the mass is made up mostly of a delicate, connective-tissue reticulum. Throughout this latter tissue abundant new and newly-forming capillaries are present; some of these contain a few erythrocytes, others a few leucocytes, and still others are comparatively empty. At points a large number of polymorphonuclear leucocytes and wavy spindle-shaped cells are seen, together with a few mast-cells.

The lower surface of the mass shows a few areas of necrotic tissue, throughout which are scattered a few polymorphonuclear leucocytes.

A number of sections were stained with Löffler's methylene blue and by Gram's method.

In the preparation stained with Löffler's methylene blue a large number of bacilli and cocci are seen. Most of the bacilli are thin, 1.5 microns in length, and occur in groups and in short filaments. Where a few are seen in a field a tendency to polar staining can be recognized. This latter feature is not seen in all the bacilli. The bacilli are situated generally between the cells, though some can be seen within the cells. They do not stain by Gram's method. A second organism is a large bacillus, 3 microns to 4 microns in length, with rounded ends, occurring mostly individually.

The cocci mentioned are .9 micron in diameter, and occur principally in pairs, with their flat sides in apposition. They retain the dye when treated by Gram's method and are intra- and extra-cellular. A few other cocci are seen that are slightly smaller than those just mentioned, but possess the same peculiarities as to situation and staining reaction.

All the bacteria mentioned above are scattered through the specimen. They are most abundant deep in the tissue, although some (bacilli and cocci) are found in the most superficial layers of the necrotic epithelial cells. The small bacillus referred to resembles very closely the bacillus of Ducrey, both morphologically and tinctorially. Every peculiarity of the bacillus, however, is not present, but the size, situation, and staining properties sug-

gest this probability very strongly. The cocci are undoubtedly the ordinary micrococci of suppuration.

Diagnosis.—"A." Inoculations upon glucose and urine agar. Pure culture of the *Staphylococcus pyogenes aureus*. Inoculations in bouillon and liquid serum, a bacillus probably of the colon group and the *Staphylococcus pyogenes aureus*.

"B." The spreads contain cocci possessing the usual mor-

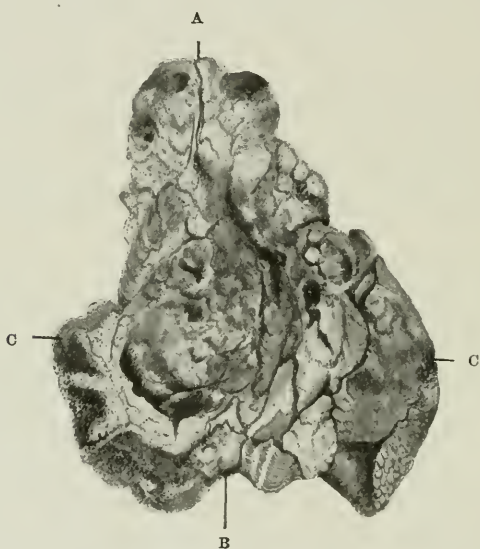


FIG. 2.—Penis after amputation; inferior surface. Natural size. (Case reported by Dr. Loux and Dr. Coplin.) A, Fissured ulcer marking area of urethra beneath the glans. B, Urethra at point of amputation; laid open. C C, Undermined skin incised on inferior surface and turned back (dorsalwards) in order to indicate the extent of the undermining. Just below the leaders from C C the intense induration is indicated.

phology and tinctorial reactions of the micrococci of suppuration.

"C." The tissue shows a widely destructive inflammation, the necrosis being of the liquefaction type. Bacteria are present in abundance; one of the organisms present cannot be differentiated from the bacillus described by Ducrey; it is not our intention, however, to insist upon the identity of the germ found with the microbe described by that observer. The histology of the tissue excludes malignant disease. At the time of this examina-

tion tuberculosis was not suspected, even after most careful search for the bacillus as well as close study of the histology of tissue submitted.

Result of the examination of the amputated penis. The specimen delivered to the laboratory consists of an irregular cylindric mass of tissue measuring 8 centimetres in length. (Fig. 2.) One end of the cylinder is surrounded by skin, which at the extreme end is normal in appearance. This end measures 3.5 centimetres in diameter, and evidently corresponds to the line of amputation. The corpora cavernosa are somewhat retracted below the surface and appear slightly denser than normal, the right being somewhat more resistant than the left. The spongy body—*corpus spongiosum*—is inconspicuous, but the urethra can readily be identified in its centre. The subcutaneous tissue and the tunica albuginea present nothing noteworthy. Upon laying the urethra open, it is found that its length does not exceed 0.5 centimetre. Its mucous membrane at the line of incision is apparently normal, but at the external opening is ragged and ulcerated and undermined to within 0.3 centimetre of the line of incision. The width of the band of attached skin varies; at its widest point it is 4.5 centimetres, and at its narrowest point a little less than 2 centimetres. As already stated, the skin is normal along the line of incision. The free margin of the skin is ulcerated, ragged, undermined, and presents areas of superficial necrosis which extend from 5 to 20 millimetres from the free margin of the ulcer upward and backward upon the otherwise normal skin. The free margin of this ulcerated portion is slightly indurated, the amount of induration varying in different areas. At all points the margin is undermined, and in the neighborhood of the urethra the undermining at one point extends 2.5 centimetres. The urethra for a distance of about 4.5 centimetres has been entirely destroyed, and with it practically all of the spongy body. The glans has been for the most part destroyed. The remaining portion of the glans measures 3 centimetres by 2 centimetres. The superior surface of the glans (all the remaining portion) is covered by a wrinkled mucosa, the margin of which forms the ragged, indurated, and necrotic edge of the ulcer. There is but little undermining of the mucosa. The surface of the ulceration is beset with minute granules and covered by a grayish pellicle which can be removed with very little manipulation. The ulcerated portion is somewhat indurated, the degree

of induration varies in different parts, but is usually more marked near the margins of the ulcer.

Small masses were cut from different areas, fixed, dehydrated, and embedded in paraffin.

Sections cut from the region of the glans show the specimen to be covered by stratified squamous epithelial cells. Beneath the epithelium is a quantity of loose connective tissue and a few bundles of non-striated muscle.

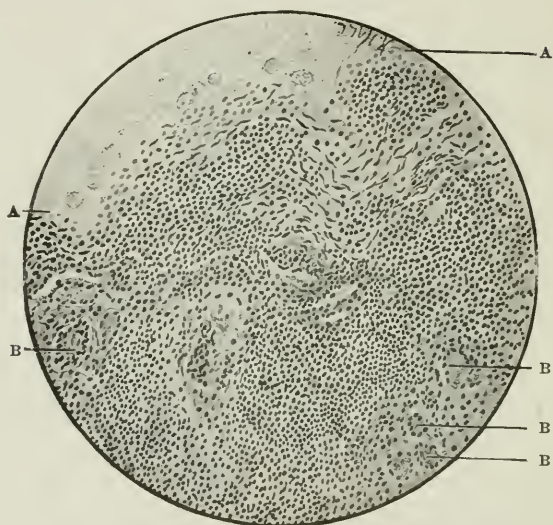


FIG. 3.—Section of floor of ulcer, case of chronic phagedæna. (Reported by Dr. Loux and Dr. Coplin.) A, A, The area between these two points is superficial and composed of the tissue undergoing liquefaction necrosis. Aside from the contained granules, a few granular and necrotic cells showing fragmentation and karyolysis are also present. B, B, B, B, Giant cells; other giant cells are also seen at several points in the field. Lymphoid cells are abundant throughout the field, and just above the centre and to the right are a number of fibroblasts. No area of caseation is present in this field.

Sections taken from the dorsum of the penis (Fig. 3) show it to be covered by stratified squamous epithelium upon one surface. Beneath this epithelial layer is a large quantity of rather dense connective tissue and non-striated muscle. Here and there can be seen accumulations of small round cells, polymorphonuclear leucocytes, a few epithelioid cells, and giant cells,—distinctly suggestive of tubercles.

They are for the most part discrete, but in one or two areas

a beginning coalescence of two tubercle-like agminations can be detected. Beginning caseation is also noticeable in other areas.

Sections taken from the region of the urethra show the mass to consist almost wholly of granulation tissue. The lining epithelium of the urethra is in some parts destroyed and encroached upon by the granulation tissue. No well marked tubercles are seen in these sections, but a few giant cells are scattered throughout. The sections were also stained for bacteria, and especially for the tubercle bacillus.

Upon examination of sections stained with Löffler's methylene blue, in the blood-vessels, intracellular and scattered irregularly through the tissue, numberless bacilli were demonstrable.

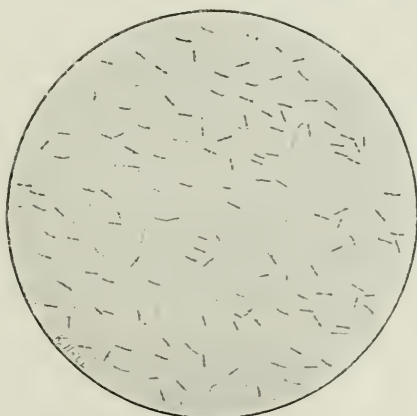


FIG. 4.—Bacillus of soft chancre (Ducrey). The irregular staining of the organism and variations in morphology are well shown. From section stained with methylene blue. Zeiss 2 mm. homo. im., projection eyepiece No. 2.

They average 1.5 microns in length, possess rounded ends, and exhibit polar staining. They do not retain the dye when treated by Gram's method. (These bacilli are similar to the organisms met with in sections from the same case made some time before, and which were then thought to be the bacilli of Ducrey.) A few cocci were also seen. No tubercle bacilli nor any other acid resisting bacilli were demonstrable.

The tissue removed from the groin was not examined; it was ordered sent to the laboratory, but was not delivered in a condition permitting examination.

Diagnosis and Remarks.—The process is clearly not a simple one. The profound tissue alterations are evidently the

result of a violent infection, mixed in character, and rapidly extending; a careful histologic study fails to show satisfactory evidence that the tissues are making any efficient effort to limit the spread of the bacteria. Not only do the bacterial findings clearly show the existence of a mixed infection, but the histology discloses the presence of two forms of necrosis occurring separately and only together in the sense that one may be consecutive to the other, a view not supported by a study of the sections. The liquefaction necrosis is evident superficially, restricted to the skin and outer layer of granulation tissue, while the caseation is present at or near the areas of giant cell agmination and not evident elsewhere. Our inability to demonstrate the tubercle bacillus in its usual form, or in some of its so-called involution types, does not exclude tuberculosis, but leaves the one essential link missing; personally, I am strongly inclined to urge the presence of tuberculosis as a part of the infection. The pyogenic infection is of course demonstrated, but space precludes its further discussion. The suppurative process induced experimentally seemed to differ in no essential from staphylococcic infections frequently seen.

Probably the most important point to be settled, if settled it can be, is whether the fundamental lesion in this case was chancroidal; should we accept the bacillus of Ducrey as the cause of soft chancre, then the bacteriologic findings are to be weighed against the clinical aspects of the case. If the clinicians decide that the lesion is not chancroid, then the bacteriologic finding is of still greater import, as I think we have demonstrated the presence of an organism that at least cannot be differentiated from the bacillus in question if it be another germ.

The bacillus of Ducrey¹ (Fig. 4) is given by Cornil and Ranvier² as the cause of chancroid. After the appearance of the papers by Krefling³ and Unna,⁴ I sectioned a number of soft chancres and studied the pus from others. I was greatly impressed with the constancy of the organism, although occasionally I examined lesions, clinically thought to be typical instances of chancroid, in which the organism

could not be found. Since that time, Peterson,⁵ Nicolle,⁶ Istamanoff and Akspiantz,⁷ Leuglet,⁸ F. Bezançon, V. Griffon, and Le Sovrd,⁹ and others have done much to establish the specificity of the organism described by Ducrey. Nicolle maintains the value of finding the organism as a test differentiation from the initial lesion of syphilis.

If the writers quoted, and others that could be mentioned, are correct in their view, then the case is one of chancroid running an unusually lengthy course and with an unusual destruction of tissue. Although, as already stated, we have failed to demonstrate the tubercle bacillus, I cannot ignore the histologic picture quite faithfully portrayed in some of the sections. Admitting the doubtful points, this lesion would be regarded as a manifestation of (1) staphylococcic infection, (2) infection by the colon bacillus, (3) infection by the streptobacillus of Ducrey, and (4) tuberculosis, the morbid processes not necessarily occurring in the order given.

[NOTE.—Since the foregoing report was submitted there have been no recurrences at points of previous operations. About the middle of February, 1902, the left epididymis became tender and slightly enlarged, and rapidly increased in size. On March 4, Dr. Loux removed the left testicle with the cord as far as the left external ring; although the examination is not as yet completed, it is sufficiently advanced fully to establish the diagnosis, and proves the testicular enlargement to be due to an acute, rather disseminated tuberculosis involving both the globus major and globus minor.

In the light of the added information, the conclusion previously reached, that the condition was primarily either chancroidal or septic, the probabilities favoring the former, and that upon the initial infection was engrafted tuberculosis, seems to be thoroughly established.]

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- ⁵ Centralblatt für Bakt., xiii, 1893.
- ⁶ Thèse de Paris, 1893.
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- ⁸ Société de Dermatol., 1898.
- ⁹ La Presse Médicale, December 12, 1900

HOUR-GLASS STOMACH.

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INASMUCH as a number of articles have appeared recently in different medical journals dealing with the surgical treatment of "hour-glass" stomach, it occurred to me that the following case should be put on record.

Mrs. F. M., aged forty-one years, Canadian, married, entered the Montreal General Hospital on the 22d of November, 1900. Fourteen years previous to admission, she had been treated for ulcer of the stomach, had been ill for a long time with dyspepsia, and had at different times vomited large quantities of blood. Two years after the first attack, she had a second similar one, though not so severe. She first consulted me in August, 1896, when she complained of distress, with frequent vomiting (no blood), after eating. Relief always followed vomiting, and the food taken could be identified in the ejecta. Patient had recently lost flesh. The stomach was dilated, and somewhat tender towards pylorus, but no tumor could be felt. A test breakfast was given and the stomach washed out, showing contents normal. Patient was put on a strict regimen, chiefly liquid, and improved in weight and general health, but always had gastric distress on any variation in diet.

In November, 1900, the patient again consulted me, giving much the same history as she did on her first visit. She had been vomiting pretty constantly, after taking any solid food, for three months, and was rapidly emaciating, weighing only ninety-eight pounds. Examination now revealed a moderately dilated stomach, with a well-defined tumor at the epigastrium, not very tender, and freely movable. I gave a diagnosis of pyloric stenosis, proba-

bly due to malignant growth, and advised exploratory laparotomy, with the object of clearing up the diagnosis and, if possible, relieving the condition. This was agreed to, and she entered the General Hospital under my care, as stated above. For one week she was kept in bed on liquid diet, with the result that all troublesome symptoms disappeared (except the constipation), and so also did the tumor, which was plainly to be felt on admission. This made it pretty certain that we had not cancer to deal with; and I now felt convinced that the stenosis was likely due to some cicatricial condition following upon the old ulcerative process. This made the operative prognosis much more hopeful, as I hoped to find a condition which pyloroplasty would relieve. Accordingly, assisted by my colleague, Dr. Armstrong, I operated on December 4.

Operation.—An incision was made in the median line of the abdomen, extending from a point just below the ensiform cartilage nearly down to the umbilicus. The abdominal muscles were found to be extremely flabby and the wall thin. On opening the peritoneal cavity, the stomach was easily found, appeared about normal in size, and, on bringing into view what we took to be the pylorus, it felt like a well marked fibrous ring, much thickened and contracted. From this ring a rather thick band, apparently of fibrous tissue, extended up to the inner surface of the right rectus muscle, just below the costal margin, and apparently acted as a sling to the lower end of the stomach. (Fig. 1, *a*). This interesting condition appeared to afford an explanation of the previous symptoms, and I can quite sympathize with those operators who, under similar conditions, proceeded to complete the operation at this stage of the examination. Had it not been for the timely advice of my associate, Dr. Armstrong, I am free to confess that I might have done the same thing. On attempting to trace down the duodenum from our supposed pylorus, we were somewhat astonished to find that we came on a second stomach. It was almost the size of the one we had already examined, and beyond it we came upon an apparently normal pylorus and duodenum. The condition was now fully before us. We had here an "hour-glass" stomach, with a band extending from the constricting central ring up to the right rectus muscle (Fig. 1). This band was as wide as the finger, and

apparently encircled the stomach. Passing my finger around it, I divided it between ligatures, when it seemed to be a hollow tube,—apparently a long diverticulum from the stomach, and probably due to stretching of some old anterior adhesion due to the ulcerative condition present fourteen years previously. The division of this band had no other effect than to render the stomach more movable, for the constricting ring would scarcely

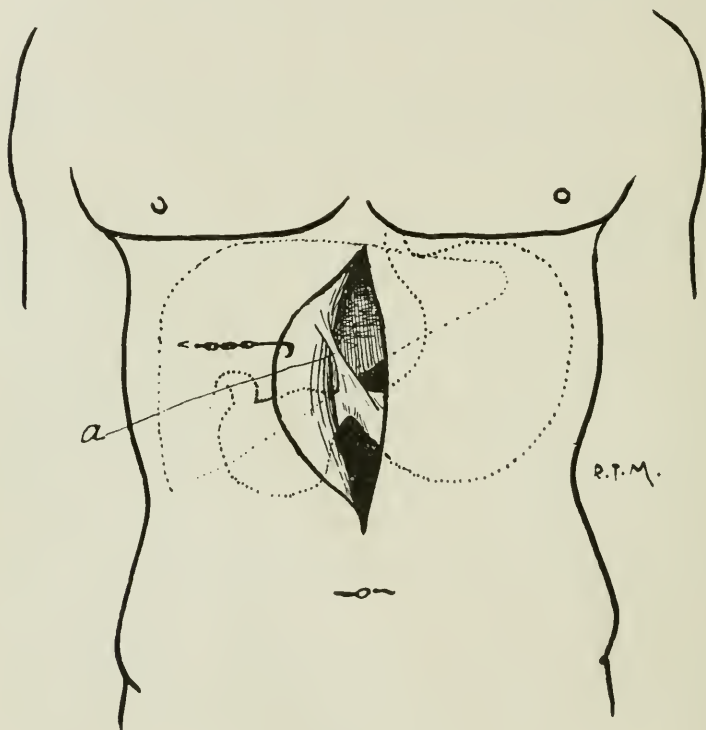


FIG. 1.

admit one finger. We decided to do a gastropasty, after the manner of the well known Heinnie-Mikulicz operation on the pylorus. An incision was made on the anterior surface of the stomach, extending from about the centre of each half of the "hour-glass" through the fibrous central ring (Fig. 2, *A*, *B*). The mucosa looked healthy, so the edges of the incision were then sewed up in a direction at right angles to the primary line of incision, leaving a fairly normal looking stomach (Fig. 3). The

opening now admitted three or four fingers with ease. Three rows of catgut sutures were used in the stomach wall. The organ was replaced, and the abdomen closed layer by layer in the usual way.

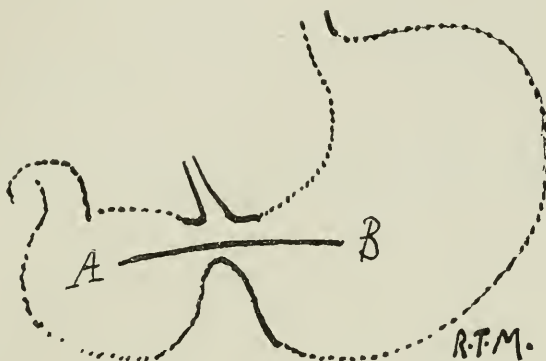


FIG. 2.

For three days rectal feeding only was given, but on the fourth day the patient was given milk and lime water, which

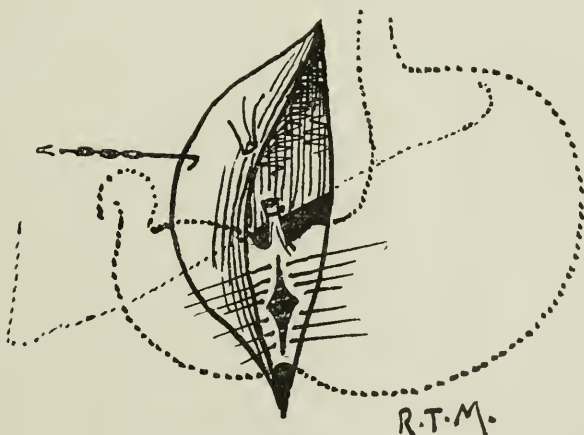


FIG. 3.

were retained, and recovery thereafter was uneventful, there being no vomiting or abdominal distress after the second day. On the eighth day after operation solid food was taken and

enjoyed, and the patient rapidly gained in strength and weight. The bowels moved regularly of themselves after the fourteenth day. She left the hospital four weeks after operation, and I have often seen her since. She has now no gastric distress, eats anything she fancies, does her work well, is not anæmic, and has regained her normal weight of 125 pounds.

In the *British Medical Journal* of March 23, 1901, Charles P. Childe published a case so similar to the one I have just reported that I think I may be pardoned for referring to it more at length, for the purpose of contrast and the lessons to be drawn from the two cases. In Mr. Childe's case, the same adhesive band due to former gastric ulceration fixed the contracted ring at the centre of the stomach to some neighboring tissue; in his case to the under surface of the liver. Mr. Childe, in operating, made the same mistake as Dr. Martin and Mr. Pollard had done (*British Medical Journal*, December 8, 1900), and did a gastro-enterostomy between the second (pyloric) part of the stomach and the bowel, which of course failed to give relief, and the true condition was only found at the autopsy. As I have already said, I can quite sympathize with the operators, and the lesson to be learned, as Mr. Childe points out, is the necessity "for very careful examination of the stomach before performing the anastomosis."

Further, I think gastropasty, where possible (and it is often possible where it at first sight appears to be not so), is decidedly preferable to gastro-enterostomy or gastrostomy in cases of non-malignant, hour-glass stomach. As regards the etiology of this condition, all the literature points to cicatricial contraction following on gastric ulcer as the cause (see valuable paper by Mr. Moynahan, of Leeds, England, in *British Medical Journal*, December 8, 1901, p. 1631). This contraction may be in the stomach wall itself, or (as in the case now reported) may be the result of adhesions of the viscus, at the point of ulceration, to neighboring parts, with subsequent stretching of the adhesive bands, and constriction of the viscus into the hour-glass shape.

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Lancet, March 19, 1898. An account by Mr. Watson Cheyne of a case operated upon with great success. The same operation as mentioned in this paper was done, though I was unaware of this report when I operated.

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[NOTE.—In addition to the valuable assistance rendered by Dr. Armstrong, my thanks are due to my friend, Dr. R. Tait Mackenzie, of McGill University, for the drawings accompanying this article.]

RUPTURE OF THE AXILLARY VEIN IN REDUCING AN OLD DISLOCATION OF THE SHOULDER.

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MONTREAL GENERAL HOSPITAL.

DURING the reduction of old dislocations serious accidents occasionally occur, though the number of reported cases is small. The nerves may be injured or the bone be fractured, and death may ensue in old and feeble persons from shock, cerebral thrombus, and embolism. Rupture of the axillary artery or vein may occur, and such an accident calls for prompt action on the part of the surgeon and tests his coolness and skill.

In many cases, after most careful and prolonged efforts at reduction, the bone still remains unreduced, and an operation has to be undertaken for its replacement. Even after all the apparently obstructing structures have been divided, the bone cannot be put into place, and excision has to be performed as a last resort; this procedure usually gives very good results, that is as regards the usefulness of the arm.

Tearing away of the greater and lesser tuberosities during dislocation is an accident which occurs more frequently than is generally believed and much complicates the case. Such a separation occurred in the case I shall now relate.

M. W., aged sixty-two years, a tall spare man with an anxious expression of face, was admitted to the Montreal General Hospital, April 24, 1901, complaining of severe pain in the shoulder. He gave the following history: During a drunken

family quarrel five weeks before, he was knocked down and kicked in the shoulder and about the chest. He was semiconscious for twenty-four hours, and on recovery suffered from severe pain in the left shoulder and down the arm. The shoulder was fixed and his arm was useless. Thinking it was a "sprained" shoulder he applied liniments, but all to no purpose; the pain increased, and the slightest jar gave him intense agony, so he came to hospital for advice.

On examination it was found he had a dislocation of the humerus into the axilla, the muscles of the shoulder and arm were much atrophied, the deltoid especially so. The arm was firmly fixed, the slightest attempt at movement giving severe pain. The elbow stood out from the side and the acromion was prominent, the head of the bone could be felt under the coracoid process. He was advised to allow us to endeavor to reduce the dislocation under ether, and he consented.

The patient was placed under ether, and whilst the parts were being cleansed and I was washing my hands, my assistant made a few slight manipulations of the joint to see how fixed the bone was, when suddenly he called out to me that something had ruptured in the axilla. I quickly reached the patient and found the axilla immensely swollen and dusky in color, the arm swollen, cold, and no pulse to be felt at the wrist. I immediately surmised that a large blood-vessel had been ruptured; so at once cut down on the subclavian, passed a temporary catgut ligature around it over a piece of rubber tubing and then cut into the axilla, which was filled with blood-clot. This clot was turned out and the bleeding point sought for. It was soon seen that the axillary vein was ruptured near the point where the basilic is joined by the *venæ comites*; the vein was attached to the capsule, which was the seat of much inflammatory thickening. It was ligated above and below, and then the head of the bone and part of the shaft were seen projecting into the axilla, the shaft quite bare. On attempting to reduce the bone with one hand in the axilla, it was found to be quite impossible, and then it was noticed that the tuberosities had been torn away. After some further efforts it was decided to excise the head of the bone; and even after this was done the tissues still prevented a return of the shaft to its proper position. The capsule and tissues round about seemed to be a huge mass of inflammatory tissue; so now an

incision was made as if for excision from the acromion down, and then it was seen that the tuberosities were filling the glenoid cavity and firmly fixed there by inflammatory adhesions. They were removed and some of the capsule cut away, and the bone came easily into position.

The ligature was now removed from the subclavian and the wound closed; the shoulder wound was sutured, and also the axillary incision, a small drain being placed at the lower end of the incision and dressings applied.

When he left the table the circulation had returned in the arm and his condition was good. Next day the tube was removed, and the man was sitting up and apparently feeling well; he had no pain and said he was much relieved.

The case went on well, the wounds healing by first intention. He was kept in hospital for some time in order to teach him how to use his muscles. His arm was manipulated daily after the second week, and before he went out on the 15th of May he had fair use of his arm, could feed himself, and the only movement which was difficult was raising the arm, the atrophy of the deltoid still existing. Patient came to hospital to report a month after his discharge, and his arm was much stronger and more useful.

PUS DILATATION OF ONE MEMBER OF A DOUBLE URETER.

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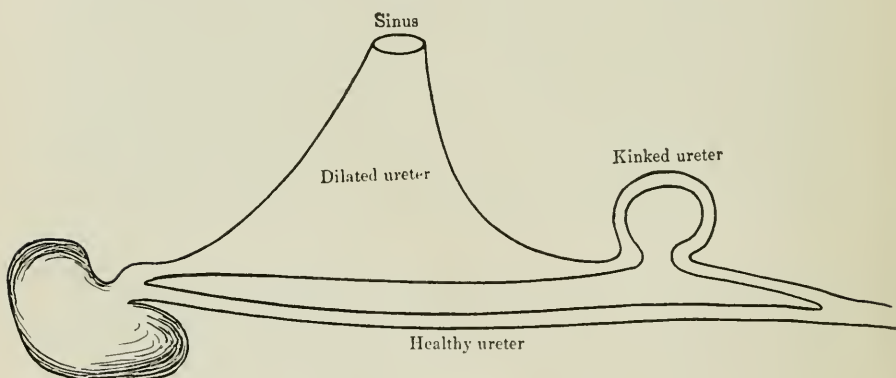
THE following case of double ureter of the right kidney, one of which, becoming dilated and infected, caused much trouble, is reported because of the comparative rarity of the condition, and because the failure to rightly interpret the early signs may stimulate others to make a correct diagnosis in a similar case, since the group of signs as shown here should put one on the alert for this anomaly.

N. D., twenty-one years of age, first came under my care at the Boston City Hospital in April, 1898. Without previous symptoms, she had developed slight pain in the right inguinal region eight days before admission. This pain gradually increased until a mass could be felt in the right iliac region, where there were tenderness and rigidity. There had been no chills nor vomiting. The urine, of a specific gravity of 1024, showed abundant pus, free and in clumps, a few abnormal blood-globules, and squamous epithelia. No tubercle bacilli could be found. Under ether, a tumor in the right renal region was easily felt, extending as a sausage-shaped mass downward and inward towards the pelvis. The right ureter was catheterized and some turbid urine was drawn, but on milking the tumor in the iliac fossa thick pus escaped from the ureteral opening around the catheter, and it was supposed at the time that the pus was too thick to enter the eye of the catheter. The urine drawn by the catheter, moreover, showed no pus, but merely urates, casts, etc. Probably the catheter tapped the healthy ureter beyond the junction of the two

ureters, but at the time this explanation did not occur to the writer.

A few days later, again under ether, a lumbar incision close to the erector spinæ was made, and, in the light of the later developments, it may be of interest to quote the account of the operation written at the time, as it shows the unsatisfactory explanation that came to the writer at that time.

On dissecting through the perirenal fat, what appeared to be kidney presented; but it was difficult to clear away the fat and impossible to bring the organ [dilated ureter] out through the wound. As it was impossible to dissect it free, it was opened at its lower end and a large amount of pus escaped. On exploring, the finger passed upward for about three inches through a smooth, narrow sinus, but without being able to enter a cavity. A small



sound, however, could be passed upward into a cavity that was probably the upper part of the pelvis [in other words, the true pelvis]. Though pus could be pressed upward from below, no catheter could be passed downward into the bladder. No stone could be felt. It seemed apparent, after the escape of much pus, that the distended pelvis had pushed the kidney upward, and itself had presented in the region of the kidney; but what tissue lay between the opening into the pelvis and the true kidney could not be determined, unless it were much thickened pelvic wall kinked on itself. The cavity was drained without further exploration, and the patient recovered well from the operation; at the end of seven weeks she was discharged with a closed sinus and voiding a clear urine free from pus and albumen. No enlargement of

the kidney could be made out; but anteriorly, just above the iliac spine, there was a little fulness and tenderness on pressure.

The patient then remained well until June, 1901, three years after operation, when she became pregnant, and began to have sharp pains in the region of the wound and frequent micturition. She re-entered my service in September, and my colleague, Dr. Lund, opened up the scar on September 17, evacuating nearly a pint of pus. He found a large cavity with pockets extending downward towards the bladder, upward under the liver and to the left of the median line. On account of her pregnancy she was discharged wearing a drainage tube. Before Dr. Lund's operation, the urine passed by the urethra contained considerable free pus and rarely an abnormal blood-globule. After operation the sediment diminished. The discomfort continued, however, in spite of free drainage, and in November she re-entered the hospital begging for relief. I prepared for a nephrectomy in spite of the pregnancy, so on the 18th she was again etherized. An incision was made close to the anterior side of the sinus, exposing a triangular bag lying close to the peritoneum and extending towards the renal and vesical regions. The kidney could not be felt in this dissection, so the sinus was freed posteriorly, and a normal kidney was found lying high up under the ribs and a second—normal—ureter lying behind the abscess sac. The dilated ureter—for such the anterior sac proved to be—was then slit up and found lined with mucous membrane, a probe passing upward to the kidney and downward towards the bladder, but at the lower portion of the bag was a nodule about an inch in diameter, which on being opened proved to be the continuation of the ureter bent like an omega, below which the probe could be passed indefinitely into the bladder, probably through the junction with the healthy ureter. The upper end of the ureter was then ligated with catgut close to the renal pelvis, the lower end well in the iliac fossa before its union with its fellow, and the intervening portion removed. The external wound was partly closed, allowing for a temporary drain of gauze. A month later she was discharged with a superficial granulating wound in good general condition, and when seen in January she was well, except for the discomfort of the increasing pregnancy.

A rough, diagrammatic sketch drawn at the time of the last operation may make the description clearer.

INTESTINAL SUTURE.

REPORT OF FIVE CONSECUTIVE CASES ILLUSTRATING DIFFERENT
METHODS OF SUTURE.

BY ARCHIBALD MacLAREN, M.D.,

OF ST. PAUL, MINN.

SURGERY of the stomach and intestine has made marvelous advances in the past few years. But we would be slow to agree with a recent writer when he says that these advances are due entirely to the Murphy button. The button is a very useful instrument, and at times the best device for certain conditions. But the suture, also, has its place, and will undoubtedly increase in favor in the near future.

The improved results are due to better surgical technique, more perfect cleanliness, as well as to a fuller knowledge of the conditions which we are called upon to correct. Surgeons have until very recently accepted Lembert's theory of a peritoneal stitch as the correct one. But I am inclined to believe that the Lembert suture is not the best. My own experience, as related below, goes to prove that the method of suture proposed by Connell at the last meeting of the American Medical Association gives better results both immediate and permanent, and can be placed almost as quickly as the button.

CASE I.—*Tubercular Pelvic Abscess, with later Intestinal Tuberculosis and Fistula; Resection of Intestine; Recovery from Operation, eventually Dying from General Tuberculosis.*

Miss L. was seen on February 28, 1901, with Dr. Asa Johnson, of West St. Paul. The patient was twenty-three years of age, and had always been well and strong. During the latter part of January she had suddenly given symptoms of a pelvic peritonitis, and had been confined to her bed ever since that time, suffering

with considerable pelvic pain and a temperature which rarely exceeded 101° F. and a pulse of 110. Upon examination she gave the ordinary signs of a pelvic abscess pointing in the cul de sac of Douglas. The hymen was intact, just admitting the index-finger. She was sent to St. Joseph's Hospital, and the next day a vaginal section gave outlet to over a pint of thick, yellow, offensive pus. The patient temporarily improved, but soon commenced to have an evening temperature ranging from 101° to 102° F.

Two weeks after the operation the sinus was dilated and considerable granulation tissue was removed, but no new pockets were discovered: one of the enlarged, dilated Fallopian tubes could be distinctly felt, with its open ampulla presenting close behind the vaginal wound. The patient was again temporarily improved, but at the end of a week the evening temperature began to fluctuate between 102° and 103° F., with a pulse of 120. It was decided that the diseased tubes would have to be removed. Consequently, on April 9 the abdomen was opened, and an abscess containing eight ounces of foetid pus was found in front of the left broad ligament between the left appendage and the anterior abdominal wall. The abscess was opened and carefully sponged out. Both appendages, with the uterus above the internal os, were removed; the tubes were found to be open, very much thickened, enlarged, and covered with miliary tubercles. A tube and a gauze drain were put in from the abdominal incision, down through the pelvis and out through the vagina. For ten days the temperature remained normal, and the pulse gradually improved. Two weeks after this last operation a faecal fistula developed, which gradually grew worse, until on May 20 all the faecal matter was coming through either the vagina or the abdominal fistulae, and the patient was rapidly losing ground from sepsis and starvation, for the openings were in the small intestine.

On the 24th of May the abdominal fistula was thoroughly irrigated and then packed. The abdomen was then opened and the cavity protected with large gauze pads. The adhesions were separated, and a large opening in the lower part of the ileum was found in the pelvis. Fully six inches of the intestine were thickened and granular, showing miliary tubercles on its peritoneal surface and tubercular ulceration on its mucous surface. Eight

inches of the intestinal wall apparently well beyond the diseased tissue were resected between two O'Harra intestinal forceps. After the mesenteric vessels had been ligated with catgut, the two forceps were locked together and an end-to-end suture was made, with two continuous silk Lembert sutures, one on either side, which were tied together at the free border after the forceps had been removed. One catgut Lembert stitch was put in over the silk knot, and the intestine was dropped into the abdominal cavity.

Just before the abdomen was closed, it was found that the sigmoid was thickened and inflamed, feeling much like the piece of small intestine which had been removed, with a small spot on it which looked like a commencing ulcer.

The patient was in such bad condition that any further work was unjustifiable. The patient recovered from the operation, but another intestinal fistula soon developed from the large intestine, as was shown by the immediate return of water injected into the rectum, and also from the different character of the fæcal matter; the thin, excoriating, small intestine contents never reappeared, but fully digested fæcal matter from the large intestine took its place. The patient lived until July 7, when she died from general tuberculosis.

Looking back at the history of this patient, I would conclude that perhaps an earlier laparotomy might have given her a better chance, although the immediate danger of a septic peritonitis would have been greater. In studying the thirty-two cases in which laparotomy has been made for peritoneal tuberculosis in the past ten years of which I have records, I must agree with Fenger that all the severe cases where the intestinal wall has been deeply infiltrated, and especially when intestinal fistulæ have formed, are not benefited by surgery. And that he is probably also correct in regard to the milder cases where only the peritoneum is affected, for I have seen many of the milder cases, temporarily improved only to relapse in a year or two, develop symptoms of general peritoneal tuberculosis from which they died.

In regard to the O'Harra forceps, it has the advantage of keeping the intestine closed until the anastomosis is made; but, on the other hand, it turns in rather too much tissue, and

by so doing obstructs the lumen of the canal much more than is done with the ordinary Lembert, or more particularly with the Connell suture which was used in Cases II, III, and V.

CASE II.—*Triple Intussusception; Gangrene of Bowel; Resection of Forty-two Inches of Ileum; End-to-End Suture; Recovery.*

Mrs. C., aged forty years, mother of three children, was seen with Dr. Boothby, of Hammond, Wisconsin, on September 1, 1901. Early last spring she had suffered from intense abdominal pain, slight temperature, and temporary obstruction, with a small tender tumor in the right iliac region, which was supposed to be due to an attack of appendicitis. She had no vomiting or blood in the stools, and soon entirely recovered. She remained perfectly well until about a week before she was brought to St. Paul, when on August 23 the same train of symptoms suddenly developed,—acute pain in the right side, a temperature of 101° F., and the formation of a tender tumor just inside of McBurney's point.

There was acute obstruction of the bowels for five days, but on the fifth day the bowels moved very freely, and she continued to have loose, watery movements up to the time of the operation. The operation was performed at St. Luke's Hospital on September 1 last. A tumor was found lying just to the inside of the ascending colon, about four inches in length. In separating the adherent coils of intestine the ileum forming the intussusceptum was opened, as shown in the photograph, and out of it was drawn a triple invagination of completely gangrenous intestine and its gangrenous mesentery. The intestine was resected, the vessels of the mesentery ligated with catgut, and an end-to-end suture made with fine silk in the following manner: The mucous membrane and the submucous coats of the two divided ends were first sutured with two running sutures of silk, each one commencing at the mesenteric border and being tied together at the free border of the intestine, these two sutures and their knots being on the inside of the bowel. Next, two continuous Lembert sutures, commencing one on either side of the mesenteric borders, closed the divided peritoneal edges, the two being tied together at the free border.

The mesentery was sutured with a few interrupted catgut sutures, and the gut was dropped with two gauze wick drains,

one on either side of the sutured intestine. The temperature reached 102° F. on the second and third days, on the fourth day her bowels moved freely. The gauze drain was not removed until the seventh day, when she perfectly recovered without a fistula, and has remained perfectly well up to the present time.

Measuring the specimen along its free peritoneal edge, it was found to be forty-two inches in length.

It is to me truly remarkable that fæcal matter could have made its way through this twisted, dead intestine; but such is the fact; for there was no accumulation of fæcal matter above the intussusception.

CASE III.—*Abdominal Hysterectomy, Ilius, Intestinal Obstruction; Intestine opened on the Fourth Day; Later Suture; Recovery.*

Mrs. S. was seen early last September, with Dr. H. Davis, of St. Paul. She had recently recovered from an acute attack of pelvic peritonitis, which was supposed to arise from her appendix. She was operated upon at St. Joseph's Hospital September 16, 1901. A large, long, adherent appendix was removed. Then a right tubo-ovarian abscess containing three ounces of pus and a left hydrosalpinx with the retroverted, adherent uterus were removed; the uterus being amputated just above the vagina. As the pus-tube had ruptured during removal, the divided edges of the broad ligaments were not sutured, as is usually the case, but the raw surfaces were covered with gauze wick drains led through a separate opening into the vagina. A tube and a gauze drain were left in the lower angle of the abdominal wound.

This woman was very sick after the operation, and by the fourth day gave unquestioned evidence of obstruction of the bowel, with persistent fæcal vomiting; her temperature was 103° F. and her pulse 140. She was given a few inhalations of ether, the lower part of the wound was opened, and the lowest coil of the ileum which could be quickly found was drawn out and opened with a longitudinal opening one inch in length. After the intestine had been evacuated and irrigated, the edges of the opening were sutured to the parietal peritoneum with catgut. Three days later she had a small fæcal movement from the rectum, and was out of immediate danger. The fistula showed no tendency to

close. The skin of the abdomen became intensely excoriated; she became very weak and emaciated. On the 29th of October the fistula was closed after Greig Smith's extra-peritoneal method, loosening the fistula with the neighboring adherent, parietal peritoneum until the fistula could be easily closed without tension.

This operation was not a success, for on November 2 fæcal matter was found coming through the wound. On the 13th she was found to have developed a very bad bed-sore; on November 26 she had become a living skeleton, with a constant pulse of 140 and above.

She was put upon the table and the excoriated skin of the abdomen simply irrigated with bichloride and then with alcohol. At the suggestion of Dr. Schwyzer, the abdomen was covered with a sterilized towel, which was cut down the centre just the length of the wound, and the towel held in place by snap forceps, catching it at several points to the edges of the divided skin. The abdomen was opened, an adhesive band two inches in length, arising from the old broad ligament wound, was divided and the intestine closed longitudinally with catgut. It was then partly folded upon itself so as to cover in the fistula, and held in this position by a few interrupted silk sutures. She commenced having full-sized fæcal movements on the second day, and has been slowly gaining, until now, at the end of two months since the last operation, she is almost entirely recovered.

CASE IV.—*Rupture of Uterus; Littre's Hernia; Intestine injured; Resection; End-to-End Suture; Recovery.*

Mrs. C. was seen with Dr. Hodgkinson, of South St. Paul, on December 18 last; the mother of two children, the last one born one month ago, when she had a severe labor, which was followed on the fifth day by a chill, but no temperature or offensive lochia. At the time of the chill, and every day thereafter, she suffered from intense short attacks of colic in the lower abdominal or pelvic cavity. She was sent to St. Joseph's Hospital, and the next day was anæsthetized. A mass the size of a small orange was found at the left of the uterus. The uterus, which was large, was first explored with a pair of probang or sponge forceps, such as are ordinarily used for holding gauze sponges. The cervix was patulous and the forceps were easily passed in without using a dilator. As soon as they had passed the internal os, they were spread as widely as the cavity would admit, for the purpose of

determining the size of the cavity and to grasp any piece of placenta or membrane which might be left. When they were brought together at the fundus, I found that they had seized tissue which did not feel like adherent membrane, but which I could not believe to be anything else. I tried to introduce my finger, but could not. Using more force, I drew down a piece of damaged small intestine. I then opened the abdomen and exposed an old, dark-colored tear in the fundus of the uterus two inches in length, into which was drawn a coil of small intestine. The intestine was drawn out, cleansed, and six inches resected. The intestine was then sutured in the manner lately described by Connell. Mattress sutures of silk, including all coats, passed from the mucous side, so that all of the knots were on the inside of the bowel. The first two-thirds of the circumference of the bowel I found very easy to suture, but the last one-third was quite a little more difficult, and I completed the end-to-end anastomosis by putting three interrupted Lembert sutures in place of Connell's last suture, partly to save time. The appearance of the sutured bowel was excellent, the best I have ever seen. This method is the best I believe that has ever been proposed. The suture at the mesenteric border is particularly good, the minimum of tissue is turned into the bowel, and the mattress sutures do not show on the outside at all. The anastomosis was made in twenty minutes.

A wisp of omentum was laid over the suture and a single gauze drain was put in down to the sutured intestine. The opening into the uterus was closed. An inflammatory ovarian cyst was opened and drained into the vagina. The bowels moved without a cathartic on the second day; the gauze drain was removed on the fourth day, and the woman promptly recovered, and is now well.

CASE V.—*Obstruction of the Pylorus; Dilatation of the Stomach; Gastro-enterostomy with Connell Suture; Recovery.*

Miss F. has suffered from frequent attacks of vomiting and gastric pain for over ten years, vomiting large quantities of material every few days; she had never vomited blood, and no tumor could be felt; she was thin, weak, and anæmic.

She was operated upon at St. Luke's Hospital on the 13th of January. A large tumor, evidently inflammatory in character, was found, involving the lesser curvature and the pylorus. An anterior gastro-enterostomy was made at the bottom of the

stomach, following Mayo's advice, using Connell's mattress sutures of silk, the opening being made one and one-half inches long. This was covered with a wisp of omentum and the wound was drained with a single gauze drain. On the 15th she vomited twice, but not at all since that time. The gauze was removed on the 17th, and she is now well, gaining flesh and strength rapidly, and feeling better than she has for many years.

THE CURATIVE EFFECT OF TREPHINING PER SE.

TWO CASES TREPHINED FOR INTRACRANIAL DISEASE,—ONE
CURED, THE OTHER MARKEDLY BENEFITED; IN NEITHER
WAS A LESION FOUND, NOR WERE THE OPERATIONS
MADE OVER THE AREAS WHICH THE SYMPTOMS
SUGGESTED MIGHT BE DISEASED.¹

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CASE I.—This patient, W. J. C., was referred to me by Dr. J. F. Hobson, and is thirty-three years of age, a railroad fireman, and has been married. His family history is good, no history of any nervous conditions in any member of his family is obtainable. He has had the usual diseases of childhood, and, except typhoid fever fourteen years ago, has never suffered any severe sickness. In September, 1893, he was struck by a locomotive and the head injured. He was taken to the West Penn Hospital, Pittsburgh, where he remained unconscious for a period of thirteen days, after which he was slightly peculiar in his actions. He went to work on his engine in the following March. In the latter part of the same month, while on his engine, he suddenly lost consciousness, and had a spasm which was strictly confined to the right side; one month later he had a like spasm. Preceding each spasm he has had the visual aura of a black ball which seems to come over the right shoulder. Up to June, 1895, he had suffered six such convulsions, all of them being right-sided, each time consciousness was lost, and each time the visual aura was present.

¹ Presented to the Cleveland Medical Society, January, 1902.

In June, 1895, a surgeon removed a large piece of skull at this point over the right Rolandic area. The bone was left out, and we now have an aperture in the skull which measures about two and one-half inches. Allow me to repeat, his convulsions were always strictly right-sided, always began with the visual aura of a ball coming over the right shoulder, consciousness was always lost, and yet the operation was made to uncover the right motor area of the cerebral cortex. I cannot learn from the patient if there were any evidences whatsoever either of fracture or depression of the skull at the point of operation. In fact, he says that there was no difference in the two sides of the skull of that region. Immediately after the operation he states that his head felt much lighter and clearer, without the former feeling of mental depression, and he then realized that his intellect was much better than it had been since his injury. He says that he was informed by the surgeon that nothing remarkable was found.

In the following November he suffered another right-sided convulsion without the aura. The next convulsion occurred in the middle of the summer. Soon after this he visited Dr. William Keen, of Philadelphia, who, after a patient examination, insisted and reinsisted that he (the patient) must be in error as to the side of his convulsion, for since he was operated on the right side his spasm must necessarily be on the left. Dr. Keen told him that he could do nothing else, and that the operation had accomplished all that was possible.

Soon after visiting Dr. Keen he went to see another surgeon, and while in the office of the latter he had a severe right-sided spasm. This surgeon reopened the original incision and exposed the seat of the former operation, enlarged the opening with a rongeur, loosened the adhesions which had taken place between the calvarium and membranes and inserted beneath the membranes a layer of gold leaf. This was in the latter part of the spring of 1897. After this second operation he was very much better, and since has suffered about two convulsions each year, excepting the past year, during which he has had but one. These are all hemispasms with loss of consciousness. He is still on his engine and appears to be in excellent health.

It is a question whether this case illustrates the curative effect of operation *per se*; the relief of intracranial pressure

by opening the skull, or a cure by the kind offices of time and nature, since we can be sure as a surgical measure for relief of his Jacksonian spasm it was never indicated and probably not performed with that idea, but for some local condition of the skull alone. Of what that condition was there is nothing known by the patient or myself.

CASE II.—Z. R., male, white, aged forty-five years, American born; is tall, large boned, dark complexioned, with very coarse hair and beard. He is not of a high grade of intelligence. His father died at sixty from "dropsy;" mother died at thirty-nine of consumption. One sister, two nephews, and both maternal grandparents died of tuberculosis of the lungs. He was married at twenty-three, and has never had any sickness but typhoid fever. His wife is alive, and is a strong, healthy woman at the age of forty-two. He is the father of seven children, the youngest two and one-half years old, all of them are in good health. They all have good teeth and no specific stigmata. The wife and patient were carefully questioned and examined for some specific indications, with a negative result.

Sixteen years ago he was struck on the back of the head by the rebound of a spring pole used for drilling. He was unconscious some hours, vomited blood and passed bloody stools. No history of blood from the ears. Nose bled, but as his face was bruised by falling, this sign cannot be regarded as evidence of fracture of the base of the skull. He went to work about six weeks after his injury and continued at work for some weeks, when he developed a bad cough and expectorated freely. At this time, he thinks, he became dull of hearing in the left ear.

About ten years ago he began to have severe headaches, which were of a dull, boring character, principally in the frontal region. This headache was inclined to become worse at night. Head was dizzy and he staggered while walking; had no nausea or vomiting; became morose and talked of suicide; was forgetful and erotic; would arouse his wife in the middle of the night and solicit favors. He had spells of trembling accompanied by confusion of ideas, but did not have convulsions nor total loss of consciousness. Headache drove him to walk the floor at night, also to groan and cry out in his sleep; at other times he slept much. He suffered general failure of mental powers, but no

paralysis, nor failure of sight, taste, or smell. No anæsthesia developed.

He was taken to an hospital, where a diagnosis of cerebellar tumor was made, and he was trephined at a point *one inch above the tentorial attachment and one and one-half inches to the left of the median line*. A button of bone about three-fourths of an inch in diameter was removed; the membranes, however, were not opened. The surgeon who made this operation informed me that there was absolutely nothing pathological discovered. It was decided to leave the bone out, closing the scalp over the opening. The patient remained in the hospital three weeks, during which time he gained steadily in weight, his headaches disappeared, his dizziness and staggering lessened, and since that time, a period of seven or eight years, he has never had a return of his former symptoms.

In this case more than the other I am totally at a loss to account for several facts: (1) What was his original difficulty, the nature and location of his lesion, if lesion he had? (2) Why did the simple removal of the button of bone, not over the cerebellar region as was possibly indicated, but over the occipital lobe, afford relief?

In an article entitled "The Supposed Curative Effects of Operation Per Se," J. William White, M.D., of Philadelphia, makes the following statements in conclusion of that very valuable and extensive article.

(1) There are a large number of cases of different grades of severity and varying character which *seem* to be benefited by operation alone, some of them by almost any operation.

(2) These cases include chiefly epilepsy, certain abdominal tumors, and peritoneal effusions and tubercle, though the improvement in the latter is, perhaps, to be explained on general principles.

(3) Of the possible factors which, by reason of their constancy, must be considered, anæsthesia seems least likely to have been effective. The other three, viz., psychical influence, relief of tension, reflex action, may enter in varying degree into the therapeutics of these cases, and taken together serve to render the occurrence of occasional cures less mysterious.

(4) The theory of accident or coincidence scarcely explains the facts satisfactorily.

I desire to make the explicit statement that neither one of these cases is presented for criticism; that they are both better is undeniable; therefore, why criticise?

The first case presented symptoms of an undoubted lesion of the cortex on the side opposite to the trephining. The reputation of the surgeon who operated is sufficient to guarantee that something which was either visible or palpable decided him to operate over the right Rolandic area, notwithstanding the fact that it was on the same side of the spasm. Whether time would have accomplished his present condition without operation is problematical. Against that hypothesis we have the explicit statement of the patient that after the trephining operation he was very much clearer in his intellect. These cases are exhibited especially to call attention to the undeniable fact that trephining the skull sometimes gives relief most unexpectedly and unaccountably.

Horsley and Weir have performed the operation of trephining in cases of localized headache of traumatic origin with success. In Weir's case the mere removal of a button of bone without opening the membranes was sufficient to relieve the pain. In Horsley's case a large Pacchionian body was found eroding the dura and skull.

The results in our second case are certainly very puzzling; here we have the removal of a button of bone either to verify a diagnosis or relieve a possible growth in the cerebellum, for such was the diagnosis. The trephining operation, however, was made above the tentorium, notwithstanding it was thought that the symptoms were those of cerebellar disease; yet there is no history of optic disk changes or ocular palsy. Just why the surgeon trephined above the tentorium I have not the means of determining; but that it was a very successful operation in its results we have the undeniable evidence of the patient himself.

After some thoughtful consideration of this extremely

interesting case, I have reached the conclusion that the trephining operation probably produced two distinct effects:

(1) Relief from intracranial pressure, and (2) a marked psychic effect. The latter was very neatly demonstrated by the statement which the wife made to me in the presence of her husband, that "It was no wonder he suffered so much pain, since there was so large a piece of bone pressing on his brain."

It would be unsafe to argue from this stand-point that the trephine should be used in the treatment of all similar cases: nevertheless, this case is one with an important precept, and that precept is: In cases presenting evidence of cerebellar pressure, fulness in the head, headache, giddiness, staggering gait, etc., operation of trephining without opening the membranes may be of signal use, and should be considered.

A CONTRIBUTION TO THE SURGERY OF SPINA BIFIDA.

By VAN BUREN KNOTT, M.D.,
OF SIOUX CITY, IOWA.

THE object of this article is simply to emphasize some important facts in the treatment of spina bifida, and to insist that those cases which are susceptible to operative relief be given the chance which has been too frequently denied.

Spina bifida, occurring as it does about once in every 1000 births, is the most common congenital deformity of the spine, and the frequency of its occurrence, together with the distressing symptoms occasioned by it, renders it a subject which is entitled to the most serious consideration.

This anomaly is usually found associated with some deformity or deformities due to arrest of or imperfect development, and is usually due to a defect in the vertebral arches. Whether this defect in the arches is primary, or is occasioned secondarily by inflammatory effusions and increase of fluid in the vertebral canal, is not known.

While the etiology of this deformity has not been definitely settled, and is still more or less in dispute, the most rational explanation of its causation seems to be that which assumes the defect in the vertebral arches to be primary. The ossification of the bony covering of the spinal cord occurs by four centres.—two for the body of the vertebra and one for each lamina,—the laminae uniting in the median line. If the laminae fail to unite, a defect in the bony casing of the cord ensues, through which the protrusion of more or less of the tissues of the cord may occur; the gap thus formed is frequently extensive.

VARIETIES OF SPINA BIFIDA.

There are five varieties of this deformity grouped as follows:

(1) *Spina bifida occulta*, in which there is simply a vertebral cleft without any protrusion of the cord or its membranes. The skin over the defect is usually covered by quite a growth of hair and is sometimes markedly dimpled. There may be no other evidences of the deformity, but frequently will be found associated with it other congenital stigmata.

(2) *Meningocele*.—In this variety the membranes of the cord protrude through the vertebral defect, the cord proper remaining in the spinal canal. Here the tumor may be the only symptom. Frequently other symptoms exist, such as hydrocephalus, more or less paralytic disturbances of the legs; and the tumor is often exceedingly tender to the touch. According to the report made by the committee of the London Clinical Society, this variety constitutes about 8 per cent. of all cases of spina bifida.

(3) *Meningomyelocele*.—In this class are placed those cases in which there is a protrusion of the cord and its coverings. The tumor wall is composed of skin and dura mater lined by the arachnoid membrane, its cavity being continuous with the subarachnoid space. When low down the cauda equina will be found spread out over the sac wall and intimately adherent to it. If the protrusion is higher up in the spinal column the cord will be found running along its posterior wall, the nerves running along its inner surface to the intervertebral foramina, or even passing directly across the cavity. This is by all odds the commonest variety of spina bifida, being present in about 62 per cent. of reported cases. Nervous and paralytic symptoms are the rule with this variety.

(4) *Syringomyelocele*.—This is a very rare form, in which the cavity of the sac is formed by the dilatation of the central canal of the cord, the wall thus containing, or rather being composed of, the cord and its covering to even a greater extent than the former variety. According to De Ruyter this form is usually lateral.

(5) *Myelocele*.—This variety is characterized by the absence of the skin over the bony defect and the direct communication with the surface of the body of the central canal of the cord accompanied by a free discharge of cerebrospinal fluid. This also is fortunately a very rare form of the deformity.

CLINICAL FEATURES.

In considering the clinical characteristics of the deformity, only those forms marked by protrusion of some of the elements of the cord will be considered, or, in other words, those accompanied by a tumor—meningocele, meningomyelocele, and syringomyelocele.

These tumors all contain fluid which is identical with the cerebrospinal fluid. In by far the greater percentage of cases the tumor is found at the lower part of the spinal column, in the lumbosacral region, and nearly always in the median line. It may, however, be found in the cervical region. The size of a spina bifida varies from a small swelling, as large as the end of a thumb, to one as large as the fist.

They may differ very materially in external appearance. At times they are very tense, with the overlying skin extremely thin. Again they may hang more or less loosely, and the skin be thick and corrugated. The tumors also vary in color; some are dark red; in some, the color is the same as the surrounding skin. I have seen a case in which the color of the swelling was a sort of a blue black. The skin may only cover the lower portion of the swelling, the covering of the upper half being very thin and consisting only of the membranes of the cord.

Ulceration of the overlying skin is often found.

These tumors are usually sessile, may be somewhat pedunculated or more or less spherical in form and fluctuating. I have seen a case in which the absence of fluctuation, together with a loosely hanging, thickened sac situated in the cervical region which gave no impulse on crying or coughing, rendered the diagnosis more than usually difficult.

The defect in the arches of the vertebræ may or may not be felt. It varies in size from a small cleft which will scarcely admit the finger-tips to a large, wide furrow. The size of the cleft does not determine the size of the protrusion which may exist in any given case.

Usually associated with these cases are found other congenital malformations, club-feet, usually talipes calcaneus, and

hydrocephalus being most common. Various nervous disturbances may also coexist—paraplegia, loss of sphincteric control, anæsthesia, and trophic ulceration of the lower extremities.

DIAGNOSIS.

As a rule, the only difficulty attending the diagnosis of spina bifida consists in determining to which of the varieties it belongs. That this differentiation should be made is important, as the prognosis will be influenced by it; the prospect of a favorable result being much better with meningoceles than in the other forms.

A meningocele may hang more or less loosely, the impulse is not so marked, and the flattened bands of the cord cannot be seen in the sac wall, nor can their shadow be discerned by transillumination. This last sign is, however, not always reliable.

This variety of tumor is more frequently found at the upper part of the spine than the other forms. Paralytic and nervous symptoms are not nearly so constant as in meningo-myelocoele or syringomyelocoele.

Meningomyeloceles are characterized by paralytic and nervous symptoms below the growth. They are rarely if ever situated high up in the spine, and usually some of the flattened elements of the cord can be made out in the sac wall or by transillumination; the nerves crossing the cavity may produce a shadow. The sac of this variety is frequently dimpled, or its centre may be even marked by a furrow due to traction upon it by the attached cord.

Fluctuation in these tumors is always marked. Syringomyeloceles are with difficulty distinguished from the last-named variety. They, too, are always accompanied by or associated with congenital deformities and nervous disturbances of the legs. Tension within the sac is usually extreme and ulceration of the overlying skin may be present. Hydrocephalus accompanies this variety more frequently than others. Pressure upon the sac will in this class produce positive signs of cerebral disturbance more readily than in the other varieties.

PROGNOSIS AND TREATMENT.

The prognosis of spina bifida is necessarily a gloomy one, as many of the children die early from marasmus, septic meningitis, etc. I believe, however, that the mortality rate may be considerably reduced if a more hopeful view be taken of the situation. Too often the physician upon recognizing spina bifida regards the case as past all hope. This is by no means invariably true. Many of these children may be spared for more or less useful lives by surgery properly applied. I have heard surgeons say that it would be a blessing if every case of spina bifida should die at or immediately after birth. That is a phase of the subject which is out of our jurisdiction, and the fact remains that a great many of them do not die and are brought to us for relief.

In considering the prospects offered by surgical intervention in this most unfortunate class of cases we should not be unmindful of what the future has in store for them if no assistance is offered. Mindful of this, we should not be too easily deterred by the unfavorable statistics so often quoted to demonstrate the futility of attempts at cure.

There is always the prospect of relief which may be secured in no other way; and if this hope is not realized, nothing has been lost by the attempt, as death is usually the inevitable result in neglected cases. In short, a patient afflicted with spina bifida has everything to gain and nothing to lose by accepting the chance of relief offered by surgery, and it was to urge that this chance be more frequently offered them that this paper was written.

In considering the operative treatment of spina bifida ligation of the sac, galvano puncture and the employment of setons may be at once thrown aside as unsurgical. We then have two methods,—excision and injection of Morton's fluid.

Several years ago the committee appointed by the London Clinical Society to report upon the best method of treating spina bifida, after considering the statistics of many cases, reported in favor of injection of Morton's fluid. For some time this plan of treatment was given preference, but as many

cases subsequent to injection developed hydrocephalus, and as many others were either unimproved or died, excision grew gradually in favor, until to-day it is the method of choice, and in my judgment the only one to consider, as by it we can release the nerve elements from the sac wall and restore them to the canal with no greater mortality than accompanies the incomplete treatment by injection.

By excision we mean the removal of the excessive skin and meningeal membranes, the separation of the nerves, if present, from the sac wall, and their restoration to the spinal canal. In performing this operation the most rigid asepsis is a *sine qua non*, and owing to the location of the tumor at the lower part of the spine extreme precautions to secure it must be taken.

A central incision over the sac should never be made, as by it the cord might be injured. As the redundant tissue of the sac is to be removed, an elliptical incision should always be employed through the skin leaving just enough skin on each side to effect good approximation after the removal of the tumor. The incision of the membranes should not be made in the same plane as that in the skin as a precaution against the subsequent leaking of cerebrospinal fluid. The membranes having been opened, if the case is one of meningocele there are no nerves present in the sac, and the redundant membrane having been removed, the meninges are closely sutured with fine catgut. If the tumor be a meningo-myelocoele or a syringo-myelocoele, upon opening the sac and evacuating the fluid we will find nervous elements spread out over the sac wall and closely adherent to it, or running across its cavity. We may find the cord flattened and adherent to the posterior wall of the sac. These nerve elements are to be freed from their attachments and returned to the spinal canal, and the remaining superfluous tissue of the sac cut away. During the dissection of the nerves from the sac wall it is advisable to prevent the escape of cerebrospinal fluid by plugging the upper end of the canal with gauze as suggested by Pearson.

The meninges are then closed by suturing with fine catgut. Now the question as to what to do with the bony defect of the

spinal column arises. Various osteoplastic procedures have been suggested for its closure. If any of the laminae are present they may be loosened laterally and drawn inward over the gap. In the sacral region a thin layer of bone has been separated still attached to the periosteum and placed over the defect, bone grafting has been employed with success and the defect thus closed, the most popular material being the scapula of a rabbit.

In the cases operated upon by me no attempt was made to close the opening in the spinal column with bone, but the muscles lying on either side were loosened so that they could be drawn in to the median line and sutured over the gap with chromicized catgut. This method of closure proved perfectly satisfactory in each instance, although in two of the cases the defect was quite large. The skin is then sutured over the muscles and sealed with iodoform collodion. The dressings should be small and frequently changed that they may not become soiled, as asepsis is absolutely essential to a good result. The results secured by excision are constantly improving and warrant its more extensive employment. In meningocele about 80 per cent. of recoveries have been secured, this being the simplest and most favorable variety.

Excision of meningomyeloceles was formerly condemned in most sweeping terms, and it is only in the past few years that it has been established as a justifiable procedure. Statistics concerning it are widely at variance, but as nearly as I can estimate the operative recovery is about 50 per cent. and the functional about 15 to 20 per cent. Syringomyelocele may be classified with meningomyelocele.

Myelocele and spina bifida occulta are not benefited by operation and must be treated palliatively.

The results as announced above, together with the hopelessness of the case if left alone, warrant an attempt to afford relief to the little sufferers from spina bifida of the meningocele, meningomyelocele, and syringomyelocele varieties, unless distinct contraindications, among which may be mentioned hydrocephalus, septic condition of the sac and extreme pros-

tration, are present. Ulceration of the sac need not be a contra-indication to excision, as by the application of carbolic acid followed immediately by alcohol it may be rendered aseptic.

I desire to briefly report four cases of spina bifida treated by excision.

CASE I.—Male infant, aged six months, referred by Dr. Rubel, of Allen, Neb., with a large, tense, fluctuating tumor in the lumbosacral region. The tumor which had been present at birth was in the median line and about the size of an orange. The overlying skin was so very thin that it seemed it must rupture at the slightest pressure. A marked impulse occurred in the growth when the child cried. The slightest manipulation of the tumor caused intense pain, and the child was growing weaker and more fretful from day to day. There were no paralytic symptoms present. The absence of any symptoms of paralysis, and the fact that, although the sac wall was almost transparent, no fibres of the cord could be seen running through it, determined the diagnosis of meningocele. As the child was rapidly losing ground, an immediate operation was advised, to which the parents consented. Under chloroform, an elliptical incision was made around the base of the tumor, and the sac dissected free down to its connection with the cord and amputated at this point, about one ounce of straw-colored fluid escaping, and the membrane closely united with fine catgut sutures. The muscles lying on either side of the gap in the spinal column were loosened and sutured together in the median line with chromicized catgut. The skin wound was then closed and sealed with iodoform collodion. Recovery was uneventful, and the baby was at once relieved of its pain and became a fat and happy child.

CASE II.—A female infant, aged four weeks, referred by Dr. Evans, of Emerson, Neb. Over the fifth cervical vertebra was a small tumor presenting unusual characteristics. It hung loosely in the median line from a broad pedicle, and in color resembled the surrounding skin. The overlying skin of the tumor was thick, wrinkled, and corrugated, giving it much the appearance of a small scrotum.

Fluctuation could not be detected, and when the baby cried, which it did lustily whenever the growth was touched, no impulse was perceptible. This infant was also losing weight and

strength; and the tumor was very painful, the slightest touch or pressure upon it causing the child to cry for several minutes. The position of the growth in the median line and its extreme tenderness were the points upon which the diagnosis of spina bifida rested, and the looseness of the sac and the absence of paralysis indicated a meningocele. Operation was advised, to which the parents readily agreed, as it was evident that the child must soon be relieved.

Under chloroform, an elliptical incision was made around the growth. The skin being incised, the membrane of the sac was revealed beneath it. This sac was dissected free down to the cord and amputated, a very small amount of fluid escaping. It was found that the communication of the sac with the cord had been obliterated, or practically so, as only a very minute opening remained in the membrane at this point, and I think that it had been reopened by the manipulation. There was no escape of fluid through it. One fine catgut suture was placed at this point to ensure its closure, and the skin wound closed. As the defect in the spine was very small, no attempt was made to close it. Recovery was uneventful, and the relief of the child was as complete as in the former case.

The obliteration of its communication with the cord explained the absence of impulse and the laxity of the walls of the tumor, and also possibly its corrugated appearance, as it was probably tense and distended with fluid at some stage of intra-uterine development, when the communication still existed. This opening having closed, the fluid had gradually disappeared, leaving the wrinkled and loosely hanging sac which was present at birth.

CASE III.—Male infant, aged three months, with a large fluctuating tumor in the lumbosacral region the size of an orange, referred by Dr. Turkopp, of Yankton, S. Dakota. This baby had no control over the sphincters, and could not use its legs. Bilateral talipes varus was present.

The skin was wanting over the upper half of the sac wall, which was exceedingly thin. Running across the middle of the sac was a pronounced groove or furrow, and flattened bands of the cord could be seen through the thin membrane adherent to

its inner surface, rendering the diagnosis of meningocele easy. The parents were willing to take even the slightest chance that offered any relief to the child; and, as the infant was losing strength and was in almost constant pain, I decided to operate, without very much hope of securing a satisfactory result. Under chloroform the skin was dissected free from the sac wall and the superfluous skin cut away. The sac was now opened laterally and the terminal filaments of the cord found spread out over its interior surface and intimately adherent to it. With considerable difficulty they were dissected loose and returned into the spinal canal.

The redundant portion of the meninges was now cut away and the membrane sutured over the gap, taking care that the suture line should not be centrally located, thus placing it on a different plane from those of the overlying structures. The gap in the spinal canal was quite large in this instance, so the muscles lying on either side were loosened sufficiently to enable them to be drawn in over the defect, where they were firmly sutured with chromicized catgut. Owing to the fact that the cutaneous covering had been missing from the upper part of the tumor, it was necessary to undermine the skin on either side, by which skin flaps were readily secured and the wound closed and sealed with iodoform collodion.

Prompt healing occurred, the baby sleeping naturally the night after operation for the first time since birth.

In this operation, done some eighteen months ago, the results have far exceeded my expectations. Two weeks after operation full control over the sphincters was present, and one month later the child was kicking its feet about lustily, something it had never before done. A letter recently received from the parents says that the baby can stand, but has not yet walked. They are to bring it in to have the club-feet corrected, after which I fully expect it to walk.

CASE IV.—Male infant, aged ten weeks, presenting a fluctuating tumor in the lumbosacral region in the median line. This tumor was the size of a large orange and the skin covering was entirely absent. In color it was blue black, and the sac wall seemed so thin that it would almost burst if touched. The slightest pressure caused the child to cry, and if this pressure was continued a sort of convulsive shudder would ensue.

The centre of the sac wall was dimpled, and at this point a nerve could be seen attached to its surface. Marked anæsthesia of both lower limbs was present together with talipes calcaneus.

This child, like the others, was really in a pitiable condition. It was weak and emaciated, could not sleep well and was exceedingly fretful, in fact, had almost worn its mother out with the constant attention it required. Operation was advised and accepted. It was carried out exactly as in the preceding case, except that it was not necessary to dissect the nerves from the sac wall, as they were free in the cavity with the exception of one filament, which was attached to the membrane at almost its centre. This was easily freed and returned with the rest into the canal. The remaining steps of the operation were similar to those of the last case, as the spinal defect here also was very large. Recovery was quite uneventful, and in a few days the child entirely lost its fretfulness and began to grow fat. In one month anæsthesia of the legs had entirely disappeared. As the operation was done only eight months ago, I do not know whether or not this child will walk, but suppose that he will, as he apparently has full control of his limbs.

These cases are the only cases of spina bifida upon which I have operated, and the only ones upon which I have had a chance to operate. I realize that the results secured have been most fortunate, and that they could not invariably be expected in this class of cases. Had I consulted my own inclination, I should not have operated upon Case III at all. In fact, operation in that case had been advised against by two very competent men. The result indicates that we cannot be positive as to how much or how little such an operation may accomplish in every case.

The recovery from the paralytic symptoms in Case III and from anæsthesia in Case IV would seem to indicate that those symptoms might have been due to the pressure of the fluid, and that early removal of such pressure might afford almost, if not complete, relief in certain cases.

CONCLUSIONS.

(1) Owing to the distressing nature of the affliction, the high mortality should not prevent attempts at surgical relief.

(2) Meningoceles, meningomyeloceles, and syringomyeloceles may be considerably benefited by operation.

(3) The improvement in function cannot with certainty be estimated before operation, and pronounced evidences of nervous disturbance are not a contraindication to excision.

(4) Asepsis is absolutely essential, and, though difficult to secure, may be maintained by exercising extreme care.

(5) The plan of having the suture lines of the meninges and the overlying tissues on different planes will in the majority of instances prevent leakage of cerebrospinal fluid.

(6) The suggestion of Pearson, to prevent the escape of this fluid during a prolonged operation by stuffing the canal with gauze, is valuable.

(7) Large bony defects may be effectually closed by muscle much easier than by osteoplastic methods.

(8) It is not necessary to keep the child off its back during the healing of the wound, as frequently advised.

(9) Children with hydrocephalus accompanying spina bifida should not be subjected to operation.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 8, 1902.

The President, L. W. HOTCHKISS, M.D., in the Chair.

ROTATION AND OUTWARD DISLOCATION OF THE PATELLA.

DR. F. TILDEN BROWN presented a man, twenty years old, a rigger, who was brought by ambulance to the Presbyterian Hospital on October 3, 1901. The injury was sustained while holding on to some ropes with the left hand, and additionally supported by twists of ropes around his left leg. As these passed the knee they were bearing against the inner side of the patella. While in this position, he attempted with the other hand to cast a rope clear; in order to reach high enough, he made a violent extensile effort of the leg, and experienced a sharp pain at his knee, but thought little of it, as he came down sailor-fashion, until reaching the ground he could neither stand nor flex the leg. Examination showed an outward and vertical dislocation of the patella. The amount of rotation on its longitudinal axis was ninety degrees, or a trifle more. Both of the articular fascets of the bone were to be distinctly felt through the uplifted soft parts. The inner edge of the patella was estimated to be bearing against the outermost border of the trochlea. Although tilted and held balanced in apparently the most unstable position, it was impossible for the house surgeon, Dr. Jackson, or any of his staff, to move the patella until under full chloroform anæsthesia, and then only with the thigh flexed, and by a sudden powerful over-extension of the knee, while two thumbs were bearing against the bone, reposition was effected. A posterior splint was applied and retained for four days. Since then the patient says the leg has been as strong and serviceable as ever.



Rotation and outward dislocation of the patella.

While a number of these dislocations of the patella have been due to direct violence alone, or to muscular contraction when the leg is extended, scarcely any of the instances of the accident, so far as reviewed, illustrate, as does this case, such a perfect condition for its production by an instantaneous combination of the two forces mentioned.

ATTACHED MOVABLE CARTILAGE IN THE KNEE-JOINT.

DR. BROWN presented a man, thirty-eight years old, who was admitted to the Presbyterian Hospital on August 10 and discharged August 28. The only point in his previous personal history which had possibly any bearing upon the ailment for which he sought relief was his occupation, that of passing boxes in rapid succession. This required a repetition of joint rotation to as full an extent as the knees would permit. His attention was first attracted to the right knee when, one year before, on alighting from a car, he felt a sharp pain at the joint and fell to the ground. The leg was locked at an angle of 135° for several minutes. Moderate swelling of the joint succeeded. The same sudden disability, pain, and temporary swelling occurred about thirty times since, but the knee-joint was not always locked.

Examination showed in the right knee a flattened, oval body the size of a small Lima bean, which appeared occasionally, and only at the inner aspect of the joint. It was freely movable, and slipped away rapidly, apparently into the interior of the joint.

On August 14, the body was transfixed and fastened by suture at the place in which it could sometimes be palpated.

On August 15, under gas and ether anæsthesia, a V-shaped cutaneous and aponeurotic flap—the convexity being forward and outward—was raised from the inner aspect of the joint, which on being opened exposed a small tongue of cartilaginous tissue folded longitudinally on itself and attached to the inner border of the internal semilunar cartilage at about its middle. The outgrowth was severed from its base. When unfolded, it was seven-eighths of an inch in length. The wound was closed with fine chromic gut sutures. Primary union. Restoration of function was complete. The pathologist reported that the growth was composed of dense fibrous connective tissue, in some parts rich, in other parts poor, in cells.

PENETRATING GUNSHOT WOUND OF THE THORAX
AND ABDOMEN FOLLOWED BY CHRONIC
INTESTINAL OBSTRUCTION.

DR. CHARLES L. GIBSON presented a young man who was shot while engaged in a battle in Colombia. The bullet perforated the left shoulder, passed obliquely downward through the chest, and came out of the abdomen at a point just above the right anterior superior spine. The nature of the injury was so severe that his case was regarded as hopeless, and for a time he was left lying on the battle-field unattended. That the gut was perforated was evidenced by the fact that for a few days after the receipt of his injury fæces exuded through the wound of exit. In spite of this, and of various pulmonary complications, he eventually recovered, and resumed active service in the army. Subsequently, he began to suffer from increasing difficulty in the passage of fæces. The bowels could only be moved by powerful cathartics, and at times there was almost complete obstruction. He also had more or less constant pain in the abdominal region.

Dr. Gibson operated on the man about a month ago, and found an adhesive band crossing the gut obliquely: this was attached just below the umbilicus, and the traction it exerted had produced a sharp kink in the lumen of the gut. Upon dividing the band the gut resumed its normal position. The patient made a rapid recovery, and has been completely relieved of all his symptoms.

In reply to a question, Dr. Gibson said the adhesion, apparently, was not in the track of the bullet. No other adhesions were found.

URETERAL TRANSPLANTATION AND NEPHRECTOMY FOR TUBERCULOSIS.

DR. F. TILDEN BROWN presented a young man, eighteen years of age, whose family history was generally good, but his mother died of pleurisy after quite a long illness, and one brother died of hasty pneumonia.

Patient, when five years old, had brain fever; when seven years old, and again at sixteen years, he had some serious eye trouble, which the doctor told him nearly cost him his sight, and when nine years old had a left mastoiditis operated on; has had typhoid and what was called slow fever. He never had any

venereal disease. The first indication of trouble with the urinary tract was in November, 1899, when he awoke one morning to pass water, and was struck with the unusual quantity voided. Immediately after this he noticed day and night frequency. This was painless for four or five months. Then he began to have a partly constant dull pain in right lumbar region. When this pain was about to leave him he would have two or three spasmodic sensations in the side, followed by urination every four or five minutes, each yielding larger amounts of urine than usual. Urine always looked milky: never saw any blood. In the summer of 1900, he had periods of a week without this lumbar pain; then it would gradually get worse day by day until it was again as bad as ever. At such time sitting was more comfortable than lying down. Last fall he had slight chill and fever like malaria; does not sweat at night. Present condition, passing urine every half or three-quarters of an hour day and night. Physical examination shows a rigid and painful mass corresponding to right ureter. Right kidney not palpable, but the test for it is painful. Left kidney not palpable, and an attempt to feel it not so painful as on right. No pain along course of left ureter. External genitals negative. Posterior urethra exquisitely sensitive, and bladder intolerant of any irrigation. There being no doubt as to the existence of a right renal and ureteric tuberculosis, nephrectomy was only postponed until the condition of the other kidney could be learned. On May 23, 1901, sent to Trinity Hospital for treatment. With only an ounce and a half of boric acid solution in the bladder, the speaker was able to catheterize the left ureter, and at the same time observe that the mucous membrane about its mouth showed no tuberculous lesions of hyperæmia, whereas the right ureter mouth showed marked tuberculous changes. Although to gross inspection normal, examination of the left urine showed several clusters of tubercle bacilli. In the face of this disappointment, the patient was sent to a sanitarium in the Catskills for three months. Improved at first, and was able to have morphine discontinued; then he became worse, and came back asking for any operation which would relieve him of the vesical and right ureter pains. The speaker hoped by ureter transplantation to possibly effect this, and, if he improved sufficiently to make right nephrectomy seem advisable, to do it later.

On August 15, 1901, under gas and ether anæsthesia and modified Trendelenburg posture, an incision from two inches below the costal border to one inch from Poupart's ligament parallel with right rectus was made. Then a right-angled incision of two inches at upper end was carried down to parietal peritoneum. Dissecting under this, the ureter was separated, doubly ligated about two inches from the bladder, and the ends cauterized. The proximal one was carried to a point in the loin well back of the operative field, and brought to the surface through a puncture and here sutured with silk. The wound was closed in layers with fine chromic gut and provision for a small drain to distal stump of ureter. There were good operative recovery and a satisfactory relief of the former pain; but gradually a condition of increasing daily pyrexia, loss of weight, and sweats came on. The urine coming from the right kidney was very purulent, and, despite the recognized existence of left renal tuberculosis, it was evident that removal of the right kidney was the only chance of saving the patient's life. To this proposal he assented, and on October 5, 1901, under gas and ether anæsthesia, an incision was made in front on a line with the right costal border. The ureter was reached extraperitoneally, ligated, and dissected out and followed upward to the kidney. This had a high position and was densely adherent about its upper pole, and removal was accomplished with some difficulty. The patient has made a slow but uninterrupted progress towards comparative health. When discussing Dr. Dowd's case of nephrectomy for tuberculosis at the last meeting of this Society, the speaker had referred to this case, and now presents the patient to show what he then maintained, namely, that even in the presence of a more or less disseminated urinary tuberculosis removal of the chief focus may be attended by a remarkable restoration.

DR. A. B. JOHNSON said that in several cases coming under his observation, where a tuberculous kidney was removed, many tubercle bacilli were found in the urine even a year after the operation, although the general condition of the patient had vastly improved. He assumed that they came from the bladder and the remaining portion of the ureter.

DR. BROWN said, in reply to questions, that he did not feel justified in doing a nephrectomy at once on account of the positive evidence of tuberculosis on the other side. Several of those who

took part in the discussion at the last meeting of the Society expressed the opinion that, in the light of the more recent experience with this class of cases, we are justified in resorting to radical measures in dealing with a tuberculous kidney in which the disease is far advanced, even if the opposite organ is affected to a lesser extent.

Dr. Brown further said that the patient's urine had not as yet been examined for tubercle bacilli since the operation. At varying times subsequent to this presentation of the patient, six careful microscopic examinations of the urine failing to discover tubercle bacilli, injection of the urine sediment into the peritoneal cavity of a guinea-pig was done with undetermined result.

THE SURGICAL ASPECT OF THE STATUS LYMPHATICUS.

DR. JOSEPH A. BLAKE read a paper with the above title, for which see June issue of *ANNALS OF SURGERY*.

DR. BLAKE said, in reply to a question, that no evidences of an enlarged thymus were found by physical examination. The speaker expressed the opinion that satisfactory percussion of the thymus gland was impossible.

DR. GIBSON said he was disappointed to hear Dr. Blake's pessimistic views regarding the possibility of arriving at a correct diagnosis in these cases; and he inquired whether a careful blood examination would not furnish a clew. Dr. Ewing encourages us to believe that the diagnosis can be made from the presence of leucocytosis, the enlarged spleen, and general diffuse enlargement of the lymphatics plus the possibility of occasionally recognizing the presence of an enlarged thymus. The speaker recalled the fact that years ago a prominent physician was apparently able to demonstrate enlargement of the thymus in children by a change in the percussion-note when the patient stooped forward.

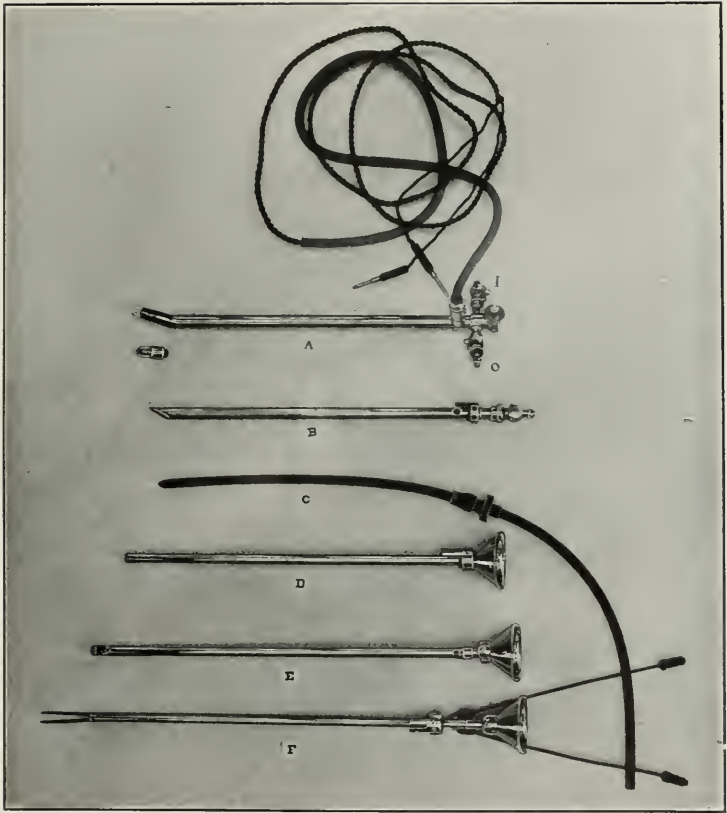
DR. DAVID BOVAIRD, JR., said that Dr. Blake's paper related to a subject to which he had devoted considerable time for several years. His observations applied principally to children, and particularly as to whether the size of the thymus bore any relation to sudden deaths. In recent pædiatric writings much emphasis has been laid upon the direct mechanical effect of the enlarged thymus gland. The speaker said that, so far as he has been able to convince himself, pressure has nothing to do with

it. He has repeatedly made a direct section just above the manubrium, and studied out the relations of the thymus and trachea; and even when the thymus was enlarged, he has never seen any case where it produced pressure upon the trachea. In a number of cases of sudden death in well-nourished, apparently healthy infants, nothing abnormal was found at autopsy but an enlarged thymus and general lymphatic involvement, and he felt satisfied that the enlarged thymus bore some relation to the sudden death in these patients.

DR. BLAKE said he did not believe that a thorough blood examination was made in many of his cases. With a single exception, they were not cases in which the existence of blood disease was indicated. The speaker said that in the rather extensive literature on this subject he has not been able to find the report of any case in which there was leucocytosis excepting in the one reported by Ewing. Furthermore, so far as he has been able to learn, leucocytosis is not expected in this condition.

A COMPOSITE CYSTOSCOPE FOR BILATERAL URETER CATHETERIZATIONS AND EXAMINATIONS.

DR. F. TILDEN BROWN said that nearly three years ago he had presented to this Society his double-barrelled ureter cystoscope, the first instrument of the kind to make practicable the synchronous collection of the separate urines. Although this feature materially increased the value of its prototype, Brenner's single catheter cystoscope, it was still evident that the scope of the instrument would be broadened if, without adding to its circumference of twenty-four millimetres, space could be found for two additional canals for irrigation. After a good deal of experimentation, he had been able, by quite a new system, to accomplish this aim for the ureter cystoscope, and to utilize its method for the ordinary direct and prismatic examining cystoscope. The new departure consists mainly in the employment of an outer lamp-carrying jacket or sheath, open at both ends, and through which various methods of irrigation can be conducted, and into which the different telescopic parts are inserted. Filling or evacuating the bladder with water or air can be carried on with any of the telescopes in place, in all of which the lamp and distal lens come nearer together than in other instruments. The pris-



Dr. F. Tilden Brown's composite cystoscope. A. Sheath carrying the lamp and irrigation cocks. B. Obturator. C. Rubber catheter with adjustable collar. D. Direct examining telescope. E. Prismatic examining telescope. F. Bilateral catheterizing telescope.

matic telescope, because it can be turned independently or together with the lamp, affords a much larger range of efficiency than the former kind. The lamp, mounted without a hood, illuminates in all directions, and, being of the "cold" type, can be used as a "feeler" of tumors or foreign bodies, while at the same time this action is being observed through the prismatic telescope.

The double-catheter telescope is ordinarily passed into the sheath after a preliminary study of the bladder by the other two telescopes.

When we speak of irrigation being feasible with the telescope in place, we do not mean that very slow and exasperating kind seen in some instruments. The most appropriate length of shaft for both sexes is six and a half inches. Some have seen reason to order the instrument either two inches longer or two inches shorter. Of course, the latter is intended exclusively for the female bladder. The fact that an obturator is needed for a safe and comfortable insertion and withdrawal of the sheath may seem to many, as it did at first to the speaker, a disadvantage; but there are so many added features of value that they completely offset the former. Enough has probably been said to intimate that the composite cystoscope is the improved equivalent of three ordinarily independent instruments. In the composite, when the common sheath has once been passed, a ready and painless interchange of the different telescopes can be practised. The Messrs. Wappler Brothers, of New York, are the makers of the instrument. An article entitled "Technique of Ureter Catheterization," in the Medical and Surgical Reports of the Presbyterian Hospital for 1902, presents a detailed account of the instrument and its use.

[NOTE.—Since this presentation, the prismatic telescope is made to serve as an obturator by bevelling its distal end.]

Stated Meeting, January 22, 1902.

The President, L. W. HOTCHKISS, M.D., in the Chair.

CHOLEDOCHOTOMY WITH CHOLECYSTECTOMY.

DR. CHARLES L. GIBSON presented a woman, forty-two years of age, who was admitted to the medical side of St. Luke's Hos-

pital on May 24, 1901. She stated that since January of that year, at intervals of about three weeks, she had had attacks of pain referred to the epigastric region and radiating inward and upward. These attacks lasted four or five days; they were accompanied by uncontrollable nausea and vomiting, and were followed by jaundice, usually not pronounced in character. The stools were clay-colored, and the urine contained bile.

When Dr. Gibson first saw this patient she was slightly jaundiced. A physical examination was negative, with the exception of the fact that deep pressure over the region of the gall-bladder elicited slight pain, which was transmitted to the median line. The gall-bladder could not be felt. The opinion arrived at was that the woman probably had a chronic form of cholecystitis which lighted up from time to time, and in addition to this a stone in the common duct, which occasionally became impacted.

An operation was advised, and on June 18, 1901, the abdomen was opened through an incision made parallel to the ribs. The gall-bladder was found to be in a state of chronic cholecystitis, with thickened walls. It contained twenty-one stones, mostly small. Another stone, the greatest diameter of which was three-quarters of an inch, was impacted in the upper portion of the common duct. The duct was incised and the stone removed. The gall-bladder evidently being the seat of chronic trouble, it seemed wise to remove it, which was done, the cystic duct being tied off. The common duct was drained with a small rubber tube protected by a glass tube.

The patient made an uneventful recovery. She reports that she has enjoyed perfect health since the operation, and has remained entirely free from her old trouble. The scar is in perfect condition.

DR. HOWARD LILIENTHAL said that up to about one year ago, when he had been converted to cholecystectomy by Dr. Gibson, he had only done the operation once, and then as a secondary measure for the removal of a cystic gall-bladder. The operation was completed without much difficulty, but on the sixth day the patient died as the result of a violent fit of coughing bursting open the wound. Since then, the speaker said, he had done the operation eight times without any trouble, all the patients recovering nicely and remaining well. Dr. Lilienthal said he considered the operation an excellent one with a wide field of usefulness.

When adhesions are present, it is not wise to promise the patients that they will have no pain at all after the operation, as the adhesions sometimes reform. The speaker said that in two of his cases the pain which was complained of subsequent to the operation was evidently due to this cause.

In connection with this case, Dr. Lilienthal showed a gall-bladder which he removed about five days ago. In this case he had found it necessary to do a cystotomy and cholecystectomy on account of a peculiar dilatation of the duct resembling an accessory gall-bladder, which was filled with stones and pus. The stones had to be removed through a separate incision into this sac.

DR. GIBSON, in reply to Dr. Lilienthal, said that in his opinion the adhesions were not apt to be permanent if the focus of the trouble which gave rise to them is removed. The adhesions are apt to be poorly vitalized, and if the congestion to which they are due disappears, they are likely to disappear also. The speaker said he had not infrequently seen illustrations of this fact after operation for various intra-abdominal conditions. In some cases of inflamed gall-bladder we may find that organ almost, if not absolutely, unrecognizable on account of the mass of adhesions, which are the result of the irritation produced by the infected gall-bladder, and that is why the operation of cholecystectomy offers some advantages over simple drainage. After removal of the source of irritation, it is probable that the adhesions will disappear.

REMOVAL OF THE ASTRAGALUS, SCAPHOID, AND CUBOID FOR CLUB-FOOT.

DR. B. FARQUHAR CURTIS presented a young man, twenty-two years of age, who had suffered from double club-foot, with extreme varus and slight drawing up of the posterior end of the os calcis. He walked upon the dorsum of each foot, the toes being turned in. This resulted, on the dorsum of each foot, in the formation of a callus as large as the palm of one's hand, and on one foot the skin had ulcerated from pressure.

The left foot was operated on by Dr. Curtis on February 27, 1900, and the right foot a month later. The operation consisted essentially in the removal of the astragalus, scaphoid, and cuboid bones through an external incision. A free incision was made extending from the internal malleolus almost entirely across the

sole of the foot, dividing the plantar fascia. After removal of the three tarsal bones and lengthening with suture of the tendo Achillis the foot could be brought into proper position. A piece of rubber tissue was laid over the open wound on the inner side of the foot, the rest of the incisions being sutured.

The operation on each foot was followed by primary union, and the result obtained in both instances was remarkably good from both a functional and cosmetic point of view. There is still slight turning in of the toes, but the young man is now able to wear ordinary shoes; he walks without artificial support, and his feet give him no pain or discomfort. The patient states that his right foot is lengthening out.

In connection with this case, Dr. Curtis showed a photograph and skiagraph taken previous to operation, and also the shoes worn at that time by the patient, which clearly showed the extent of the deformity. Dr. Curtis said he had operated on quite a number of cases of extensive club-foot, and he called attention to the fact that on account of the tension of the tissues and pressure of retentive apparatus, even very slight infection is apt to produce serious results. This is likely to occur unless a very radical operation is done, with removal of some of the tarsal bones. In some cases, amputation may become necessary, as was done in one of his cases in which infection took place.

DR. LILIENTHAL said he thought the result obtained by Dr. Curtis was excellent. Recently he had operated on a case which proved a failure. The patient was a girl, about twenty-two years of age, with a very marked club-foot. In operating on this case, Dr. Lilienthal did not go to the extent of removing any of the tarsal bones: he did a very wide osteotomy, making an incision almost across the entire plantar surface, and a longitudinal incision on the outer side of the foot. The position of the foot was then corrected in a fairly good manner and fixed in plaster. There was no infection of the wounds, but considerable cedema followed the operation, and the limb became so painful that the cast had to be taken off. On the inner side of the foot, where the plaster had pressed most strongly, a pressure necrosis was found. The speaker said he had done nothing further in this case up to the present time. He asked Dr. Curtis as to the advisability of another operation in this case.

DR. CURTIS said he regarded the removal of the bones as the

main point in the success of these operations. A cuneiform osteotomy is not so good a method of correction. The astragalus should be removed first, and then, if necessary, the scaphoid and cuboid. There is usually little trouble in keeping the foot in its proper position if sufficient bone is removed.

Stated Meeting, February 12, 1902.

The Vice-President, HOWARD LILIENTHAL, M.D., in the Chair.

IDEAL CHOLECYSTOTOMY.

DR. LILIENTHAL presented a man, thirty-five years old, who, about three and one-half years ago, had an attack which resembled gall-stone colic. There was considerable pain and slight jaundice. During the subsequent eighteen months he was entirely free from any symptoms of gall-stone; then his attacks began again, and came on with increasing frequency. His symptoms indicated the presence of a pure cholelithiasis. He never had a chill nor fever, and there was only a suspicion of jaundice.

Dr. Lilienthal saw the case in consultation with Dr. Morris Manges, and operated on December 3, 1901. The condition met with was such that it was decided to do an ideal cholecystotomy. There were five or six stones in the gall-bladder, which were evacuated, together with two which were pushed back from the cystic duct. As there were no evidences of inflammation of the gall-bladder, it was closed. The wound itself was then closed in three tiers, namely, peritoneum, posterior fascia, and the aponeurosis. Instead of suturing the skin wound, its edges were brought together with strips of sterilized zinc oxide rubber plaster.

The patient made an uneventful recovery, and left the hospital three weeks after the operation. Since then he has enjoyed excellent health and has gained about twenty-five pounds in weight.

As a further illustration of the method employed by him in closing the external wound in the above case, Dr. Lilienthal showed two boys upon whom he had operated for appendicitis during the quiescent stage of the disease. The appendix was

removed through the usual incision; then the peritoneum, posterior fascia, and aponeurosis were sutured, and the skin was brought together by means of strips of adhesive plaster. By this method, the speaker said, we avoid stitch-hole abscesses, and as the skin contributes little, if any, towards the strength of the abdominal wall, there is no immediate weakening of the line of union. The method should not be employed, however, in those cases in which tension exists; otherwise, he knew of no objection to its use. If there should happen to be a little deep infection, there are no stitch-holes to become infected and no skin-stitches to be taken out. Furthermore, we know that the slight infection of a cutaneous stitch may invade the deeper tissues and vitiate the entire result of the operation. This fact is especially noticeable in hernia and other intra-abdominal operations.

In reply to a question, Dr. Lilienthal said that he uses the Johnson & Johnson sterilized zinc plaster. He has employed this method for over three years and earnestly recommended it to others.

DR. JOHN F. ERDMANN said that while ideal cholecystotomy might do very well in selected cases, the operation has recently been strongly opposed by Richardson and others on account of the dangers of over-distention, with rupture or leakage at the line of suture and infection of the peritoneal cavity. His first cholecystotomy was an ideal one, but since then he personally has always done the drainage operation or cholecystectomy.

DR. CHARLES L. GIBSON said that in 1894, when he did his first gall-bladder operation, he simply removed the stones from the gall-bladder and sewed it up again; the operation presented no difficulty whatever, the patient made an uneventful recovery, and has enjoyed excellent health up to the present time. The speaker said he had never resorted to this method again, however, because he became convinced that by this "ideal" cholecystotomy we simply remove the *products* of gall-bladder disease and do not attack the cause. The case shown by Dr. Lilienthal was evidently a favorable one for ideal cholecystotomy, as no changes were recognized in the gall-bladder; but still the patient's history points to previous attacks of gall-bladder disease, followed by remissions and exacerbations, analogous to what we find in cases of recurrent appendicitis.

Dr. Gibson said that while the use of strips of zinc plaster

in the closure of the skin wound possessed advantages which might be considered desirable by some, he personally saw no reason for giving up his present method of closing these wounds with sutures of the very finest silk. His results have been extremely satisfactory by this method, and it has never given rise to the slightest trouble. The sutures can be left in indefinitely and the resulting scar is insignificant. In some cases it is impossible to see the cicatrix at a distance of more than six or eight feet from the patient's body.

DR. LILIENTHAL said he was willing to admit that even an ideal cholecystotomy was not ideal surgery. Ideal surgery, in such cases, would include not only removal of the product of the disease, but at the same time the cause. Nevertheless, in a case like the one shown, where there is no history of previous severe attacks of gall-colic and no evidence of inflammation of the gall-bladder, and where the only symptom, practically, is pain resulting from the mechanical presence of stones and the efforts of the viscera to expel them, if it can be pretty well established that there are no stones in other parts of the biliary passages,—in such a case a cholecystotomy is not necessarily bad surgery. This operation should only be done, however, in those instances where the gall-bladder appears to be perfectly normal and there is no distention. The operation should not, of course, be recommended as a routine measure.

In reply to Dr. Gibson, Dr. Lilienthal said he formerly used very fine silk sutures in closing the skin wound, passing the sutures not through the entire thickness of the skin, but only through its more superficial layers. The method took a long time, and there was always the danger of a stitch-wound infection; both of these disadvantages are avoided by using strips of adhesive plaster.

As regards the choice of a suture, the speaker said he thought silk was preferable to catgut. If infection takes place, the catgut is apt to swell and block the opening, while silk does not swell and acts as a drain.

MYXOSARCOMA OF THE SCIATIC NERVE.

DR. F. KAMMERER presented a specimen in connection with the following case: The patient was a Polish woman, twenty-four years old, who came to the hospital in an extremely cachectic

and emaciated condition. An examination showed an immense tumor of the right thigh, which had ulcerated slightly. There was also a tumor on the opposite thigh, about the size of two fists. Both of these growths were located on the posterior aspect of the limb; they were symmetrical in appearance. Just above the crest of the left ilium on the back a smaller growth was situated apparently in the skin and subcutaneous tissues.

The large ulcerating growth, of course, made the impression of a parietal sarcoma; it was scarcely movable. Potassium iodide was given in large doses, as the symmetrical appearance of both growths suggested the possibility of a specific lesion, but without effect. Owing to high temperatures and a septic general condition, it was decided to attempt removal of the large decomposing mass on the right thigh. This was found to be intimately connected with the sciatic nerve and extended well up against the posterior pelvic wall. The operation, which was done on May 22, 1901, was a very bloody one. The patient recovered well, but died on July 16. The tumor proved to be a myxosarcoma starting from the sciatic nerve; in other parts of the nerve there were numerous neurofibromata. After extirpation the large tumor soon recurred, rapidly growing to almost the size of the original growth. At the autopsy, metastatic deposits were found in both lungs, in the diaphragm, and the head of the pancreas. The tumor on the left thigh was also a sarcoma, forming a spindle-shaped growth in the course of the sciatic nerve.



CASE II.—Congenital displacement of scapula.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, January 3, 1902.

The President, RICHARD H. HARTE, M.D., in the Chair.

CONGENITAL MISPLACEMENT OF THE SCAPULA.

DR. JOSEPH M. SPELLISSY reported two cases of congenital misplacement of the scapula that he saw during the past year.

Case I was that of a girl, seven years old, seen in June at the University Hospital, and referred to Dr. C. L. Leonard, of the X-Ray Department, because the nature of the anomaly was not recognized. Suggestion was made at the time that the abnormality might be due to the presence of a cervical rib. The patient was not seen again till November, when the X-ray plate was seen for the first time and the condition understood.

Case II, that of a girl, aged eight years, was seen during August at the Orthopædic Hospital. The condition existing was recognized by inspection at once, and three months prior to diagnosis by X-ray of the first case.

The speaker termed the condition "congenital misplacement of the scapula" because there is no apparent luxation of any joint. The right scapula is placed on top of the shoulder, and the inferior angle very much elevated in contrast to the inferior angle of the scapula of the other side. The joint relations of the humerus and scapula are perfect.

This condition necessitates some distortion either of the relations of the clavicle with the sternum; or of the clavicle with the acromion; or in the shaft of the clavicle, or, most probably, of all three combined. Careful inspection and palpation of the parts involved and study of the skiagraph deny that there is luxation of the clavicular joints. The fact that fracture of the clavicle is accompanied by dropping of the scapula renders the supposi-

tion of old and unrecognized fracture untenable. The shape and size of the clavicle and scapulæ affected, when compared with their fellows, hardly permits them to be classed as malformations; yet the manner in which they are assembled must be admitted to be a malformation which is best described as a misplacement, and which must have originated in utero.

There is no history of traumatism. In the second case, the deformity was noted at the age of three. At this period the child had a painful swelling of the neck; it was treated by the family physician, who denied that the condition was due to parotitis. No positive opinion was obtained. Here, also, there is no history of traumatism.

SUTURE OF THE ACROMIOCLAVICULAR ARTICULATION FOR DISLOCATION.

DR. W. B. HOPKINS presented the case of a Swedish sailor, twenty-three years of age, admitted to the Pennsylvania Hospital, June 10, 1901. Four months before he had been injured in the



FIG. 1.—Plaster cast showing dislocation of acromial end of clavicle.

left shoulder by falling from aloft. Examination showed complete dislocation of the acromial end of the left clavicle (Fig. 1). The joint was exposed by an incision five inches in length, and

after preparing out the bones a suture consisting of seven strands of silkworm gut was inserted through four drill-holes, as shown in the accompanying diagram. Tension on the suture completely corrected the deformity, and a knot on the outer side held the bones firmly in place. The subsequent history of the case was without incident, the wound healing promptly. After retaining the arm to the side for three weeks, the patient was discharged cured.



FIG. 2.—Dislocation of clavicle.

The speaker's object in reporting this case, he said, was to illustrate complete dislocation of the acromial end of the clavicle; to show a suture which seems to be the most effective one for the retention of the acromial end of the clavicle in place; and to emphasize the importance of taking, when practicable, a plaster cast of all dislocations in order to emphasize the deformity. Fig. 2 shows the index-finger of the operator thrust completely under the clavicle. An incision, five inches long, was made over the shoulder. In order to get at the bones well for the application of drills, the joints had to be quite freely exposed. After that was done, a suture, which may be described as an X-shaped suture,

was used, consisting, as shown in Fig. 3, of seven parts of heavy silkworm gut, carried through holes made in the following manner: A drill-hole was made at a point a quarter of an inch from the extremity of the bone into the centre of the articular facet; another one from a point three-quarters of an inch farther forward, also to the centre. The other holes at corresponding points were drilled in the acromion, to the centre of its clavicular facet. Traction made upon the suture brought the articulation into nice apposition, the central holes in the two facets. The one in the clavicle looked farther forward and downward than the one in the acromion, so that when the knot was drawn tight the tendency was to over-correction, the acromion becoming more prominent than on the sound side. The suture was drawn tight and tied with a knot over the acromion, so that the latter should be over

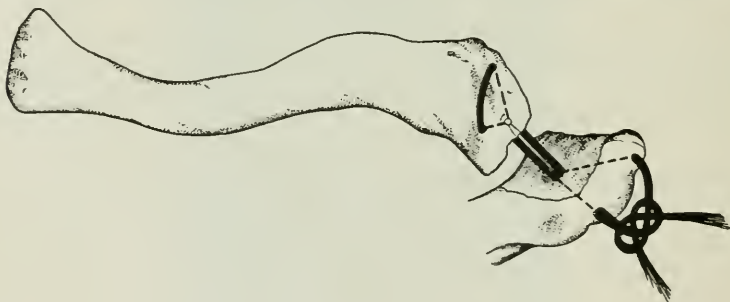


FIG. 3.—Showing X suture for acromioclavicular dislocation.

the side of the shoulder rather than over its summit. This precaution was taken in order to avoid irritating pressure from loads carried on the shoulder, as the knot was a large one.

DR. JOHN B. ROBERTS said that he had long thought that if he came across a case of dislocated clavicle that seemed to need more than ordinary treatment, he would simply nail the fragments together subcutaneously.

DR. J. M. SPELLISSY said that he had the privilege of seeing this case at the period of its luxation and later during convalescence, and desired to bear testimony as to the perfect result obtained. The deformity was absolutely reduced and kept controlled. At a slight distance the scar was undiscernible. On examining and manipulating the joint subsequent to suture, no separation could be effected.

DR. H. A. WILSON said that there are many cases of disability, following the wearing of apparatus for effecting an acromioclavicular ankylosis, which are due to the prolonged use of the apparatus.

DR. R. H. HARTE thought that in this case there was no alternative but to do what was done. When you come to examine the acromion and the clavicle, it seems a wonder that they do not give way much more frequently than they do. We see many fractures of the clavicle, but seldom a dislocation of the acromial end, which was so very marked in this case. We have here in this joint two bearing surfaces which are very narrow, and consequently, when dislocated, there is a great tendency for the deformity after reduction to reappear; and if it cannot be controlled by keeping the patient upon his back with a weight upon the shoulder, he should not hesitate to employ suturing, as Dr. Hopkins did. As to the suture, his preference is the silver wire carried through and through, two openings at each opposing surface. He preferred the silver wire, which he used with the expectation of removing it in the course of four to eight weeks, according to circumstances.

CARCINOMA OF THE PENIS FOLLOWING CIRCUMCISION.

DR. W. L. RODMAN presented a man, thirty-four years of age, who was circumcised last February. Soon thereafter he noticed a small red spot in the cicatrix, and in the course of time a typical epithelioma developed on the dorsum of the penis. The speaker amputated the penis well behind the glans. The patient having a good-sized penis, it was not necessary to go back to the crura. There was also seemingly a metastasis in the inguinal glands of the left side. The enlarged glands were removed, together with the fat in both groins. What seemed to be metastases was an irritative enlargement of the glands, and there was no evidence of carcinoma in the lymph nodes. The man has no trouble in micturition; his pain has left him entirely, and since he went home, less than three weeks ago, he has gained nine pounds in weight. He has erections, and has a fairly good-sized penis at the present time. The end of the organ was covered over by a natural skin covering. The wound united per primam.

The speaker further said that he was able recently to get a report upon two cases of epithelioma of the penis operated upon

by him in 1891 and 1895, respectively; and both of them are entirely well at the present time.

The interesting features in connection with this case of epithelioma of the penis presented are, first, the age of the patient; and, secondly, the possible development of epithelioma in a recent cicatrix.

SARCOMA OF THE PAROTID.

DR. RODMAN presented a man, aged thirty-five years, who noticed a swelling nine years ago underneath the ear, which progressed slowly. In 1894 it was the size of a pigeon's egg, and the tumor was then removed. For two years after excision there was no return of the growth. Then it began to grow slowly. The patient seemed never to suffer except with stiffness of the neck. The growth was the size of a small orange when it was removed six weeks ago.

The two points in connection with this case were that the overlying lymph-nodes were quite extensively enlarged and involved. Of course, that is occasionally seen in sarcoma growing from glands. The next point of interest is that the operator was able to remove the growth and the lower half of the parotid without inflicting very much damage to the facial nerve. The patient can do everything except whistle.

No attempt was made to prevent suppuration in this case; it was rather invited. The wound did suppurate. The speaker thought there is no doubt that sarcomas which suppurate freely at the time of operation are less likely to recur than when the wounds unite per primam.

DR. JOHN H. GIBBON had been interested in an article on the subject of growths of the parotid gland by Butlin, in which he says that the majority of cases diagnosed as sarcoma of the parotid were in reality cases of endothelioma. This was borne out recently in a case which he had operated on for a recurrence. Dr. Da Costa had operated on this patient a year or eighteen months previously for a growth which was diagnosed as sarcoma of the parotid. This growth returned after a year. Dr. Copelin examined it, and said that this growth was an endothelioma, although previously diagnosed by the pathologist as sarcoma.

DR. RODMAN said that it is true that many pathologists claimed that certain sarcomata are really endotheliomata; but this is true of lymphosarcomata and alveolar growths, where there

is a reticulated substance and always a small round-cell element. In this case it was a typical spindle-cell growth. Examination was made by Professor MacFarland. There was quite a lot of cartilage in the tumor which is characteristic of spindle-cell sarcomata. There could be no doubt about this being a spindle-cell growth, and it could not possibly be an endothelioma.

ABSCESSSES IN THE RIGHT ILIAC FOSSA, AND
SOME OTHER LESIONS NOT OF GYNÆCO-
LOGIC OR APPENDICEAL ORIGIN MIS-
TAKEN FOR APPENDICITIS.

DR. JOSEPH M. SPELLISSY read a paper with the above title.

DR. DAVIS called attention to a case that came under his notice that presented a form of possible origin of abscess which he had never seen before. A patient had an ischiorectal abscess which was followed by the appearance of a swelling in the region of Scarpa's triangle. It then apparently appeared above Scarpa's triangle in the right iliac fossa, whence it was opened, a sinus leading downward and inward to the region of the lesser trochanter and downward towards the perineum. It was not an appendiceal abscess, because the appendix was afterwards looked at and found to be perfectly normal. If one were allowed to theorize on the subject, it could be suggested that the pus might have arisen in the ischiorectal fossa and then worked its way up possibly through the upper portion of the thyroid foramen, appearing in Scarpa's triangle and thence upward striking the fascia later and working its way farther outward. It is true that this seems a rather far-fetched route; but, as a matter of fact, the abscess did begin in the ischiorectal fossa, and was also opened and pus evacuated in the iliac fossa.

DR. WHARTON recently had a case bearing upon Dr. Spellissy's paper. A young man received a fall in a gymnasium and struck the right side of his pelvis. He got up and walked home, but that evening he had severe pain in the right iliac fossa. His family physician was summoned, and he thought at first it was an injury to his hip. He thought possibly the young man had received an injury to the neck of the femur, and was examined under ether with a negative result. The speaker saw him two weeks after the injury, when he was in bed, his thigh flexed almost to a right angle with the pelvis. He had tenderness and

induration low down in the right iliac fossa. He had the patient removed to the hospital, and a day or two afterwards made an incision just above Poupart's ligament, and as soon as the tissues were divided there was an escape of pus and blood-clot, which he found arose from the separation of the iliacus muscle in the pelvis. He could pass his finger down over the surface of the ilium, the periosteum being stripped off and the peritoneum being pushed upward into the muscle. The amount of material collected under the iliacus muscle was certainly a pint, and consisted partly of pus and blood-clot. This case presented at first many of the symptoms of appendiceal abscess.

DR. JOPSON spoke of a case of abscess arising in the soft parts of the iliac fossa. It was in an infant two or three months old, arising without apparent cause, and appeared as a swelling above and to the outer side of Poupart's ligament. Its deep origin was not suspected until it was opened, where the speaker found that he could pass his finger deeply into the iliac fossa. This case healed rapidly.

The other case was a boy of sixteen or eighteen who presented a swelling of rather rapid growth above the outer border of Poupart's ligament. In some ways it resembled a rapidly growing sarcoma, although its cystic nature was rather apparent. There were no symptoms of hip or spine disease; it was very evident that it contained fluid. It proved to be an abscess of the sacro-iliac joint which had followed the iliac fascia, pointing above Poupart's ligament instead of in the back.

DR. WILLARD said that the erratic course frequently taken by pus originating from the spine or from various portions of the ilium is so common that we ought to be on our guard for abscesses appearing in the right iliac region. We are so liable, of course, at the present time to look upon all these accumulations as appendiceal. I have seen a number of large abscesses which were undoubtedly purely iliac not psoas abscesses,—not from the spine,—but caused by a rupture of, or severe injury to, the iliac muscle by violent contraction, the fibres of the muscle being torn. In two cases very probably the injury to the muscle would have ended in resolution, but, owing to attacks of influenzal grip, degeneration occurred, abscesses formed, and large quantities of pus were evacuated. Various abscesses may creep down from the vertebral column or from the region of the kidney or liver, and present themselves in the right iliac fossa.

TRANSACTIONS OF THE CHICAGO SURGICAL SOCIETY.

Stated Meeting, January 6, 1902.

The President, CHRISTIAN FENGER, M.D., in the Chair.

DERMOID CYST OF THE CHEST CAVITY.

DR. L. L. McARTHUR reported two cases. The first was a young woman, thirty years of age, brought to the surgical department of St. Luke's Hospital with a diagnosis of empyema. She had borne children, and had enjoyed good health, but up to four years prior to her admission to the hospital she had developed under the left axilla a large rounded mass which was pronounced sarcoma, and its removal advised. The patient feared operation, went to another physician, and he tried internal medication. During the time of internal medication the patient became pregnant, and the growth took on an active increase in size. Reasoning from this that the growth was influenced by pregnancy, the physician in charge induced a miscarriage. The growth again became stationary, and for two years the patient did fairly well. Between the second and third months of a new pregnancy, the growth, now as large as an orange, began again to grow; patient was sent to St. Luke's Hospital, and a miscarriage was induced. The growth again apparently became stationary. During convalescence, nine or ten days after the miscarriage, fever came on, with an eruption, which was supposed to be measles. This eruption disappeared in a few days, but the fever continued and increased with the development of pain in the right chest. Dr. Kolischer, who had induced the abortion, called in Dr. Otto Schmidt, of this city; a diagnosis was made of probable empyema of the right chest wall, and an exploration with a hypodermic syringe seemed to confirm that diagnosis. The patient was sent to the surgical side, and the empyema was

drained under cocaine anæsthesia, without resection of the rib, but when drained, it was found that in addition to pus hair escaped as well as a greasy-like material. Freely washing out the cavity with double drainage-tubes not benefiting the patient, and the temperature going higher and higher, to 103° F., with marked infection by the bacillus pyocyaneus, it was decided to open widely and remove the growth. He therefore resected the fifth, sixth, and seventh ribs at the anterior axillary line, and found the growth lying in contact with the inner aspect of the ribs. No pleural cavity was found. It seemed to have been entirely obliterated. An effort was made to determine the size of the growth by peeling it away from the ribs in each direction, and then from the diaphragm, going farther and farther, the enucleation seemed easy for total extirpation. The enucleation was easy until he found a portion opposite the lung hilus, about the mediastinum, in the middle line, and about the third or fourth dorsal vertebra. At that point the tumor was extremely adherent and difficult of removal. In its removal he accidentally severed the phrenic nerve, which had been pushed by the growth outward to the chest parietes near mammary line. After much perseverance, final enucleation of the growth was accomplished, having emptied it (largely by his manipulations through the fistulous opening which had been made) of its cheesy and fatty, mixed-with-hair contents. The cavity appeared to occupy the right chest. The heart could be seen beating against the pericardium very tumultuously. He was alarmed at the severity of the surgical insult. However, after putting in a large packing of gauze, draining and washing out the cavity regularly, the patient convalesced until the cavity which the tumor occupied had diminished two-thirds or three-quarters of its original size, and the temperature had declined to 99.5° F.

This case was of extreme interest to him because it constituted the third case of dermoid tumor that had ever been removed from the chest cavity. He stated (quoting Christian) that eight cases had been operated on, although forty had been reported in the literature. Of the eight cases, six were drained; in two the tumor was extirpated. None of the six cases in which drainage of the growth was instituted permanently recovered. They lived for periods varying from three weeks to a year and a half, while of those extirpated both recovered. Dr. Christian, in

the Boston City Hospital Reports, gives a most elaborate *résumé* of this subject.

Specimens of the various portions of the growth had been removed and examined microscopically to determine if any of the peculiar changes which take place in dermoids were similar to those changes which appear in epithelial structures, namely, degenerations of a malignant type. The large growth which the patient had on the opposite side was to be removed at the time of the operation. The patient was so profoundly shocked from the removal of the dermoid that he feared to subject her to further surgical insult.

HERMAPHRODITISM WITH IMPERFORATE ANUS.

DR. L. L. McARTHUR reported the case of a child, twelve hours old, brought to him one evening at the Michael Reese Hospital with imperforate anus and the condition ordinarily termed hermaphroditism. Otherwise, the child was apparently normal, well developed, weighed six pounds, and had a good circulation. The child was brought to him because of the absence of an anal opening, and for the purpose of having one established. As the raphe was to be seen, an attempt was made to find the rectal pouch below, which failed. After following the hollow of the sacrum up as high as the promontory, and opening into a large sac (by a small puncture) which contained fluid, the fluid simulating urine, the opening made by the puncture was closed, the child turned on the side, and an attempt made to find the colon. Hurriedly a retroperitoneal lumbar colostomy was made. On going through the three layers of the muscles of the lumbar region and through the transversalis fascia and peritoneum, a tubular mass was pulled into the wound, incised, and found to be hollow. It contained no meconium. The tubular mass admitted the index-finger snugly and followed the course of the transverse colon, as was demonstrated both with probe and finger. The child being but twelve hours old, and the duration of anæsthesia having been more than an hour, he discontinued further attempts at finding the meconium-containing cavity, and therefore desisted till morning. The next morning, nothing having come in the meantime from the tubular structure, he made an inguinal incision in the semilunar line and came down upon a distended gas-containing organ, with a fatty margin simulating omentum, which to the

feel of the finger and to the eye looked like a stomach. No small intestine could be seen. The peritoneal pouch did not extend below the level of the umbilicus. Breaking down the peritoneal pouch, he could follow down to the tumor, which he had opened into the night before, and inasmuch as no intestine could be found, and the tumor seemed to be, so far as could be determined by palpation, inspection, and carrying the hand in front and behind, the stomach, he deemed it wise not to open it. He closed the opening he had made, and in thirty-six hours the child died.

The specimen showed the kidneys, a portion of the perineum and the vulva, and a clitoris beneath which a urinary opening through which urine escaped, and through which a catheter could be passed. On each side there was a labium majus, but no labia minora, the latter replaced by a rudimentary penis. He demonstrated on the specimen the position in which the organs lay, with the perineum below. He came across an organ which felt thick enough to be the stomach; it could be grasped; one could feel above and below it. He did not open this. At the post-mortem a small mass of intestinal coils was found up under the liver. The specimen, as removed, showed the kidneys terminating in a cloaca, which had been opened and closed through the perineum. It also showed that the immense cloaca in which the intestine terminated communicated by a very small orifice with the large urinary cloaca, and a small amount of meconium was seen coming out of the small lateral orifice, so that he thought it was one of those cases of *ani vesicales* referred to by Ahlfeld.

SEPARATION OF THE LOWER FEMORAL EPIPHYSIS.

DR. S. C. PLUMMER presented a boy, fourteen years old, who, on the 2d of July, 1901, while riding on the foot-board of a street-car, was knocked off by a wagon that came close to the car. A clear history of the manner of the accident could not be obtained. On examination separation of the lower epiphysis of the femur was found. The lower epiphyseal portion of the femur was dislocated forward in front of the shaft of the femur, the end of the shaft projecting into the popliteal space. On the 5th of July, three days after the injury, the patient was anæsthetized, and the epiphysis easily reduced by merely flexing the knee at a little less than a right angle. On extending the leg dislocation

took place again, the epiphysis sliding up in front of the lower end of the shaft. When the two separated surfaces were brought in contact, there was a rubbing elicited, which was milder and more delicate than a bony crepitus.

The diagnosis of epiphyseal separation was aided by the relation of the point of separation to the adductor magnus muscle. The line of separation was beneath the tubercle. The condyles of the femur were in normal relation with each other and with the head of the femur. As it was found easier to get the parts in normal position by flexing the knee, it was adopted as the position in which the limb was treated. The boy was put on a double inclined plane, the knee being flexed at an angle greater than a right angle, and allowed to remain there from the 5th of July until the 8th of August, at which time good and solid union had taken place, with fairly good motion of the joint.

DR. E. WYLLYS ANDREWS discussed the point of arrest of development following epiphyseal fracture or epiphyseal separation, saying that it had a medicolegal bearing. He was obliged to look up the matter in connection with a case in which a fellow-practitioner was sued for malpractice. The fellow-practitioner had beautifully adjusted a Colles' fracture in a child with an excellent result; but after the child had grown to manhood there was a shortening equivalent to one and one-half inches of the amount of growth, so that a deformity resulted. After a laborious search of the literature, he found that there were a number of similar cases, in which mostly the radius was fractured; also some cases in which other bones had been fractured, but in which there were perfect results at first. The cases of preliminary fracture, at or near the epiphysis, had been followed by arrest of growth, therefore shortening was not present at the time the fracture was set, but the subsequent course was exceedingly marked.

DR. WILLIAM E. SCHROEDER recalled the case of a boy who had tuberculosis of the hip, which was not due to traumatism. The limb was put in a cast, and the boy was directed to remain in bed for a year, this being the treatment advised at that time. One day he thought he would remove the cast. He did so, and when he pushed the epiphysis, separation occurred. The boy's limb was put in a cast again, but it required three or four months longer before union took place. He was surprised to get separation in that way.

In looking up the literature on this subject, he had found that some Englishman, whose name he could not recall, had written an extensive work, and had reported a number of such cases. It was found that these patients, when put to bed and directed to remain there, particularly young patients, were more apt to have epiphyseal separation from slight trauma than they were otherwise.

DR. A. I. BOUFFLEUR stated that some three years ago, a boy, in running across a lawn, not noticing a rail which was a little over a foot high from the grass, stepped next to it and accidentally fell over it, sustaining an epiphyseal separation. In this case a diagnosis of dislocation was not only made, but positively adhered to by some member of the Cook County Hospital Staff. The case was presented by one clinician as a subluxation, and by another as an epiphyseal separation. The condition, however, was such that upon very careful measurements and examination without an anæsthetic, but particularly under an anæsthetic, the line of separation was distinctly determined to be at the epiphysis. The boy was about the age and size of the one exhibited by Dr. Plummer. Recovery was uneventful, with a perfectly useful limb.

ONE YEAR'S OBSERVATIONS IN THE SURGERY OF THE GALL-BLADDER.

DR. A. J. OCHSNER read a paper with the above title, for which see June issue of *ANNALS OF SURGERY*.

DR. WILLIAM E. MORGAN said he had been careful to question all of his gall-stone cases in the last four or five years in regard to the manner in which they disposed of fats, sweets, and starchy food, and he had found it almost a universal rule that they were unable to take care of sweets and starches, having to cut down their potatoes and bread to small amounts. Very few were able to digest oatmeal and rice, but almost all could take care of fats very well. The majority of them were fond of fats, and fats did not distress them.

He mentioned the case of a woman, fifty years of age, who was taken sick with all the symptoms of acute intestinal obstruction. Medicinal measures failed to effect a passage of the bowels. She vomited fæcal material, and was almost in a collapsed condition when brought to the hospital. He operated, thinking he would find a twist in the bowel in the neighborhood of the left flexure of the colon. He found there adhesions which he was

able to trace to the common duct. The abdominal cavity contained about a pint and a half of bile-colored fluid. In fact, it was so distinctly bilious that he pronounced it bile as soon as it made its appearance. The adhesions had formed gradually from the common duct over to the left flexure of the colon. A loop of bowel was pushed up under, fourteen inches long, and caught there, so that she was suffering from acute obstruction due to an internal hernia. But having gone thus far, and the patient being already in a desperate condition on account of the gangrenous condition of the gut, he was requested by the relatives to go ahead and find out the cause of it. Tracing up the common duct, he found a stone the size of a pigeon's egg, which he removed, saved, and exhibited. The patient lived twenty-four hours after the operation. This case showed what an enormous stone could exist in the common duct without apparent symptoms. There was no jaundice in this case; the woman had never had any pain; she was able to digest her meals thoroughly. She was a large, fleshy woman, and had worked up to the day the obstruction occurred.

His memory reverted to a case which occurred a year and a half ago in which, after removing the stone, he was about to close the abdomen, when he noticed a sudden gush of gastric fluid. He traced up the flow of fluid and gas to the stomach, and found a little leakage in the stomach; grasping the opening between his fingers they went right through the stomach. He grasped a mass of jelly-like material which was shaped like the stomach, but it was perfectly gangrenous tissue, and, in trying to pull up the stomach into view to operate upon it, he tore a hole two and a half inches long and an inch and a half wide in the right end of the stomach. The stomach did not have enough anchorage to permit his fingers to grasp it sufficiently to say that he really had it grasped. What this was due to he did not know, because he was unable to obtain a post-mortem examination. However, he believed it was due to a shutting off of one of the larger arteries feeding the stomach at its origin. The stone in this case being located in the common duct and close to the duodenum, it made severe pressure on the surroundings. He could see how a stone in that locality could completely cut off arterial circulation, and thus cause starvation necrosis.

Gall-stones in the common and cystic ducts, in the common

duct especially, seemed to have a tendency to produce hæmorrhagic infarctions of the kidneys. Post-mortem examinations showed this in a number of instances. He had seen three or four post-mortem examinations in which there were hundreds, and even thousands, of small hæmorrhagic infarctions of the kidney, and a careful urinary examination would sometimes lead physicians to be cautious on the side of safety.

DR. L. L. McARTHUR referred to the symptomatology in connection with gall-stones, and directed attention to the fact that Dr. Frank Billings had, in two or three cases which had been operated on, elicited from the patient pain in the right shoulder-blade when passing a probe into cystic duct. This, in the majority of instances, was due to stone in the cystic duct rather than to stone in the hepatic or common duct. This was a point in diagnosis which would aid one to some extent in determining the location of the stone.

Again, in diagnosing the location of the stone, experience had taught him in four cases that a stone in the cystic duct could cause such a pronounced jaundice as even to be considered due to malignant disease of the liver by competent men. This probably occurred through mechanical pressure on the common duct in the effort of the stone to escape from the cystic duct, so that it did not necessarily follow, because jaundice was present, that the stone was in the common duct.

In two cases he had seen very pronounced ascites associated with a large stone in the cystic duct. Ascites associated with jaundice was usually taken to mean malignant disease of the hilus of the liver, because it was generally believed to be due to involvement of the portal radicles; so that with a pronounced, persistent jaundice, associated with a steadily increasing ascites, it was usually conclusive evidence that malignant disease as well as stone might be present.

Last July he had occasion to make, as a last resort, an operation upon a patient in the practice of Dr. Favill, who had been seen by von Jaksch in Prague, and who had sent him immediately home to undoubtedly die, as he said, from malignant disease of the liver, with no thought of operation. When the patient reached Chicago, he was seen by Dr. Fenger, the diagnosis of malignant disease of the liver confirmed, and "hands off" the verdict. This man was in that terrible condition which obtains after six

months' persistent jaundice, and, in addition to an enlarged and hardened liver, he had extreme ascites. On reviewing the history with Dr. Billings and Dr. Favill, he suggested that, as a *dernier ressort*, at least an exploratory laparotomy be made, if a stone be found, to give the patient relief; and if it were possible to make a cholecystenterostomy, to do that, and relieve the jaundice. In the face of fatal issue, which the patient was told might easily and quickly ensue because of the dangers of hæmorrhage and of his great emaciation, patient requested an operation. A quick exploration of the gall-bladder was made. The gall-bladder was found packed with stones, with one large, barrel-shaped stone plugging the cystic duct. The patient died on the third day after the operation. Nothing was seen of malignant character at time of operation except nodule on liver edge. A partial post-mortem examination revealed on the margin of the liver, at a point close to the gall-bladder, a small hazel-nut-sized tumor, which was removed for examination, and was pronounced an adenoma; but no malignant disease of the liver, the duodenum, the stomach, or pancreas was seen. Thus it may be possible for stones to produce the most characteristic symptoms of carcinoma in that neighborhood, and had the patient been operated on earlier his life might have been prolonged.

A second case was one that had been under the care of Dr. Moore, of Minneapolis, and for whom an operation for stone had been made. Again impaction occurred, likewise ascites; operative intervention relieved both the ascites and jaundice, and the patient recovered.

DR. ALEXANDER HUGH FERGUSON asked whether the essayist had ever encountered a case of flexion of the gall-bladder. He said obstruction to the biliary tracts might take place in any part from the capillaries to the larger ducts, including the common and cystic ducts. He thought pain in cases of gall-stones was caused by two things; first, by the spasmodic contraction at the neck of the bladder by stones entering the cystic duct; and, second, by distention or by stretching.

He believed an examination ought to be made for bile in every case of hepatic colic in the early stages, when stones were in the gall-bladder and engaged in the cystic duct, because there was a certain amount of absorption of that bile. This was a good diagnostic point.

He emphasized the importance of the prod, which was pointed out some years ago by Jordan Lloyd. If a patient with trouble about the stomach and gall-bladder region was given a sharp prod over the gall-bladder, it would likely disturb the stones in the gall-bladder and cause considerable pain immediately afterwards.

DR. DANIEL N. EISENDRATH spoke of the temperature in connection with gall-stones. He had occasion to look up the subject in preparing a paper which he read before the American Medical Association last year, and said that in the majority of cases of gall-stones with temperature, the infectiousness of the micro-organisms was spent not only on the gall-bladder, but on the intrahepatic bile tracts. In a case of infected gall-stones which he reported at that time, and in which the gall-bladder was drained, all the gall-stones were removed with the exception of a small one located at the orifice of the cystic duct, yet the patient died in two days with the temperature rising to 108° F. There was no peritonitis. The peritoneum was completely sterile. The most of the liver substance or liver parenchyma was necrosed, and he thought this condition explained the fever phenomena.

DR. O. BEVERLY CAMPBELL expressed himself as not so sure of the harmlessness of bacteria in the gall-bladder when there was no obstruction in the duct, as mentioned by the essayist. According to the bacterial origin of gall-stones, this statement would hardly do. It was unnecessary to have obstruction to produce gall-stones in case there were bacteria in the gall-bladder. He thought it was perfectly possible that we could have gall-stones without any obstruction. It was true that obstruction in the common duct would produce gall-stones. In a great many catarrhal conditions of the common duct which arose from infection from the duodenum, in time gall-stones were a complication. He could recall several cases of chronic catarrh of the common duct associated with jaundice of several years' standing, occurring in the Missouri Valley, near the Missouri River, produced by malaria. These cases developed gall-stones. In one case he removed a single gall-stone from the gall-bladder that weighed over an ounce.

DR. JOHN B. MURPHY expressed himself as believing that every gall-stone was the sequence of infection which produced cholesterolin by degeneration of the epithelial cells of the gall-

bladder mucosa, and not by precipitation of cholesterin from the bile, nor precipitations of the biliary salts, as was generally believed; they were, therefore, formed pre-eminently in the gall-bladder, rarely in the ducts, and only in extraordinary conditions in the hepatic parenchyma. After gall-stones were formed, they might remain many years without producing any special symptoms until there was infection in the alimentary canal, which produced a greater or lesser degree of infection of the gall-bladder, and by this infection there was an increase in the product of mucus or purulent material in the gall-bladder; or some other irritation of the gall-bladder might also increase the secretion which starts the stone in transit through the ducts. Once suppuration had occurred, the patient did not recover, as a rule, until he was operated on, or a fistula into the intestines had formed. Dr. Murphy did not believe, with Dr. Ferguson, that the large stone which he found had increased in size as a cholesterin mass in the intestine. If it increased in size in the intestine, it did so from the accretions of material in the intestine, and not by the addition of pure cholesterin. The majority of stones found in the gall-bladder are made up of pure cholesterin, and only here and there are they stained with salts of the bile acids.

As to elevation of temperature in cases of gall-stones, it corresponded with our knowledge of the anatomy of the lymphatic supply of the bile tracts; when the infection was in the fundus of the gall-bladder itself, the temperature was usually low, as there are few, if any, lymphatics in the wall. When the stone was impacted in the neck of the gall-bladder and there was suppuration, in many cases the temperature rose to 103° F., but rarely exceeded that point, a natural result of pus retained in a sac with few lymphatics in its wall; under such circumstances, little absorption takes place, even under pressure. When the calculus entered the cystic duct, and was close to the common duct, the temperature was higher, as the lower portion of the cystic duct has a fair supply of lymphatics. When the stone became impacted in the common duct, its favorite seat was in the ampulla of Vater, or close to the lower end of the duct at the intestinal wall. In this position occurred the most pronounced symptoms of sepsis; chills, repeated and severe, with elevations of temperature to 103° to 106° F.; here was the richest lymphatic supply of the tract. The chills and fever have characteristics peculiar

to the cholangic infection. (1) The chills occur with the most pronounced irregularity as to time of day, number in one day, or number of days or hours intervening between them, as well as degrees of severity. (2) The temperature is such that Dr. Murphy has called it the temperature angle of biliary infections. Its rises and falls are always sudden, and it remains very high for hours and then suddenly drops to about normal, and remains for hours or even days at that level and suddenly rises to a great height. It does not take a diurnal rise and fall, as other pus infections, nor is there a two, three, or four day change, as in malaria. Its irregularity and angularity are classic, and are only simulated by temperature changes of infective endocarditis. That the changes may be better appreciated, he called them the temperature angles of cholangic infections.

With reference to the remarks of Dr. Morgan, he believed that if the cases were analyzed the fact would be brought out, as established by Dr. W. A. Evans in his cases, that fat necrosis occurred frequently when the stone was impacted in the common duct. He thought this explained the situation found present in the case cited by Dr. Morgan. The size of the stone in the other case referred to by Dr. Morgan was a matter of great consequence, as he could never comprehend how a stone of that size could be in the common duct without causing jaundice. He could, however, understand its being there without producing colic. He had a beautiful illustration of that fact in the case of a doctor from Vancouver on whom he operated. A diagnosis of malignant disease of the common duct or pancreas was made because of the absence of colic preceding the manifestation of jaundice. A stone one and a quarter inches in length and three-quarters of an inch in diameter was found in the common duct. He wished to communicate the following laws: (1) Biliary colic was produced by the passage of a foreign body along the biliary tract, and was not the sequence of retention of bile under pressure. (2) Every jaundice produced by gall-stone obstruction was preceded or accompanied by a colic. (3) Jaundice, the sequence of cancer of the ducts or pancreas, cicatricial or catarrhal obstruction, was never preceded by a colic. (4) A biliary colic is the manifestation of a foreign body moving along the ducts. When it becomes stationary for a short period of time, the colic ceases, though the

stone may remain in the duct an indefinite period of time and the jaundice continue.

He mentioned an exception to the second law in the case previously cited, the only one out of something over 350 cases he had operated, and he maintained that it should be recognized that the jaundice which occurs with colic or preceded by colic was an obstructive jaundice from the passage, a foreign body, and that a jaundice which occurred without colic was an obstructive jaundice without the passage of a foreign body. Pain might be present with stricture, with carcinoma, with flexure of the ducts, with catarrh, but it was not a distinct colic, it was pain. As a rule, one can by the symptom of colic alone make a differential diagnosis between malignant cases of jaundice which are the sequence of neoplasms at the head of the pancreas or duct, and cases of gall-stone jaundice which are the result of the passage of a foreign body. Temperature was not present with gall-stones unaccompanied by infection. Where there is mild infection, temperature might be absent. Jaundice never disappears so long as the stone is in the common duct. It might become a shade or shades lighter by a ball-valve action of the stone, but it always continues while the stone remains in the duct. The colic, however, disappears within a very short time after a stone becomes stationary in the duct.

He was pleased that the essayist emphasized Dr. Fenger's paper in reference to ball-valve action of stones, and he wished to mention that Osler called attention to the ball-valve formation many years ago. The first paper of importance on "The Fever of Obstructive Jaundice due to Cholelithiasis" was written by Dr. Wm. E. Quine nearly twenty years ago. Dr. Quine cites cases and post-mortems which showed that stones produced an intermittent type of fever with jaundice. Jaundice as a symptom was absent in the entire course in 84 per cent. of the cases of gall-stones operated by Dr. Murphy. There were many cases of deformity in size and location of the gall-bladder, and in one it was deep in the right lobe of the liver, and was opened through the external surface of the liver.

DR. OCHSNER, in closing the discussion, considered the point brought out by Dr. Morgan, regarding the digestion of sugars and starches, a good one. In a statement in his paper which he had not read, he directed that those foods should be avoided and

fat supplied, because in this way the troublesome symptoms would be relieved, and he was certain that his own experience corresponded with that which Dr. Morgan had described. He was surprised in one case in which there were thirteen stones in the common duct, some very large ones, to find that there was no obstruction to the passage of the bile. At least that was the history given. It was possible that there was an obstruction to the bile during the early part of the disease, but that it was not observed. The symptoms of Dr. Billings, to which reference was made by Dr. McArthur, should be borne in mind.

He had seen patients who were severely jaundiced with no stone or stones in the common duct, yet with a stone in the cystic duct, in whom jaundice disappeared. The explanation he gave was this: He supposed the obstruction in the common duct was due to œdema, and that by draining the gall-bladder, after removing the stone in the cystic duct, the œdema in the common duct had subsided, and that this accounted for the disappearance of jaundice and the later passage of bile through the common duct. But it was possible that the stone in the cystic duct caused the irritation. Occasionally there were cases in which there had been cholelithiasis in which there had been present gall-stones for many years, and the present symptoms were such as could be found in carcinoma, and which corresponded to the symptoms which were constantly found in cases of carcinoma. Occasionally the practitioner would find a case in which extreme jaundice was present, although the colic had subsided for months, or possibly years; severe vomiting, the patient being unable to retain any food, leading one to suspect the existence possibly of a carcinoma of this portion affecting the pancreas, the common duct, and the pylorus of the stomach. Even in a case of that character, greatly emaciated, with a mass in this region, the condition might be due to the impaction of a number of gall-stones in the gall-bladder. One of these cases he had had under observation, in whom the removal of the gall-stones relieved the patient permanently, both as regards jaundice, vomiting, and emaciation. He was glad to know that ascites was not a positive symptom. He had seen cases of flexion of the gall-bladder. He had seen a case in which there was a high appendix, with a perforative appendicitis, adhesion of the omentum to the tip of the gall-bladder, probably due to the peritonitis caused by the appendicitis, but not due to the

presence of gall-stones. He believed there were cases in which the omentum or the transverse colon was adherent to the tip of the gall-bladder; this adhesion was not always due to an infection from within the gall-bladder, but to an infection from without. He mentioned a case in which infection occurred during an acute perforative appendicitis, adhesions formed, and when absorption took place, the omentum and the transverse colon pulled down the gall-bladder, and made a sac in which there was residual infected bile, so that we had an obstruction such as we had in a bladder which was folded back over the prostate.

The prod over the gall-bladder referred to by Dr. Ferguson was valuable in that it convinced both the patient and the physician.

Regarding the differential diagnosis between carcinoma and gall-stones, we frequently have gall-stones primarily and we have carcinoma develop secondarily. We also have gall-stone colic; we have impaction of gall-stones, and in each case after the operation there are no further gall-stone colics, but, notwithstanding that fact, we might have jaundice. In his own experience, jaundice, with that exception, in which there was a positive diagnosis of carcinoma made by everybody and by himself before the operation, the conditions corresponded because no further gall-stones passed through the duct, and consequently the patient had simply pain and no further colics.

DR. BAYARD HOLMES presented specimens of (1) adrenal tumor of the kidney; (2) accessory thyroid gland.

EDITORIAL ARTICLE.

CLAYTON PARKHILL, ANATOMIST AND SURGEON.

CLAYTON PARKHILL was born in Vanderbilt, Pennsylvania, in April, 1860. He started out in life with the great advantage which comes to the farmer's boy in acquiring robust health and a wide knowledge of nature. He studied in the common schools, later graduated at the South-Western State Normal School, and afterwards took a special course at Wooster University, in Ohio. He then taught school for two years.

Deciding to study medicine, he began under a preceptor, and in the fall of 1881 entered Jefferson Medical College. In 1883, he was graduated with the degree of M.D., and obtained an appointment as House Physician in the Philadelphia Hospital, after a severe competitive examination. Here he served for one year, meanwhile finishing the course at the Pennsylvania School of Anatomy and Surgery, under Dr. McClellan.

In Jefferson Medical College he came under the influence of many of the great teachers of America, men who have probably given us a greater number of practitioners than any others of the country. We can scarcely measure the influence upon a young and eager student of the impression which the example of such men as Gross, Pancost, Keen, Ashhurst, and Agnew must have made. Behind all great deeds must lie some great source of inspiration. Jenner was John Hunter's pupil; McDowell was a student of John Bell. From the men whom we have mentioned, and Dr. McClellan, whose assistant he became, Parkhill drew the inspiration for his great life's work.

Settling in Philadelphia, he intended to practise there. He felt within him, however, the need for a wider field. He felt as thousands of other young men in different walks of life have felt, that with the proper opportunity he could do great things, and he did as they had done before him,—he turned his face westward, where, in a virgin land, he might find the great untilled field which he sought. In 1885 he settled in Denver, and he brought with him the most precious thing the emigrant ever carried to a new country,—the priceless seed of great undertakings.

Let us look at the then condition of surgery here, that we may appreciate what he did. Was there no surgery in Denver in those days? Yes; but, without an appreciation of the change which has taken place in the art since that time, one cannot understand why there was such an opportunity for a young man with modern ideas.

The surgery of America in those days was still in the masterly grasp of those great surgeons who, in the bloodiest war of modern times, had advanced their profession to an enviable position. In practically every city of the land, the leading surgeon was a man who, after Antietam, Gettysburg, and Cold Harbor, had amputated, perhaps, scores of limbs in a single day. The young man thirsting for a place in surgery, stood no chance in the race with men whose operative work in a single day had exceeded all that he might hope to do in ten years.

As a result, the surgery of the country in 1885 was in the hands of men already getting past middle age, and not easily adaptable to new things; as fine a class of surgeons, nevertheless, as ever honored the profession of any country.

Meanwhile the times had changed. Under the stimulus of the work of Lister, antiseptic surgery had been born. The older men watched the younger ones as they fearlessly invaded field after field upon which they had never dared to tread, and they hesitated in their work. The knowledge of bacteriology had been their undoing. A few of these men, conspicuously Keen, of Phila-

delphia, and Conner, of Cincinnati, adapted themselves to the new order of things; the great majority of them were crowded out by the younger men.

And had these excellent men, thus crowded out of their field of activity, done nothing for surgery? Let us look briefly at their work. After one of the great battles, perhaps 100 amputations were performed. Experience had taught them that in the serious wounds of the extremities, without amputation, 75 per cent. died; with immediate amputation, 75 per cent. lived. In other words, amputation avoided fifty deaths in each 100 cases, chiefly from septicæmia, pyæmia, erysipelas, secondary hæmorrhage, and hospital gangrene. But the new surgery made unnecessary most of these amputations, practically annihilated all these causes of death, and yet saved most of the limbs. Competition under these circumstances was out of the question.

The older men then stepped aside so far as operative surgery went; but the magnificent knowledge of non-operative surgery which these men had attained, executive ability of the first order, and the power of handling large bodies of men, left them still invaluable to the profession and the world. As an illustration of this point, note that as the great railroads pushed westward, almost every one had as chief surgeon one of these able men. Mercer of the Union Pacific, Livingston of the Burlington, and Bancroft of the Denver and Rio Grande, may serve as examples. During the transition period of which I speak, although the young men carried on their operative work independently, they continually sought the counsel of these older men in broad surgical questions, in their fractures and dislocations, and in many other non-operative parts of the field of surgery for which an incomparable experience had so magnificently fitted them.

Settling in Denver, Parkhill became demonstrator of anatomy at the University of Denver, and at its organization, demonstrator of anatomy and professor of clinical surgery in Gross Medical College. He was afterwards professor of surgery and

dean of the medical department of the State University. Upon the reorganization of the Arapahoe County Hospital, he was appointed visiting surgeon, and here and at St. Luke's, to which he was also attached, he did his great work. It was here that he devised his apparatus for cleft palate, his jury-mast for fractures of the jaw, his apparatus for intestinal anastomosis, his device for supporting the body during operations upon the kidneys, and his invaluable clamp for ununited fractures. By the latter alone he is known throughout the civilized world. Within two years after its introduction, even from the interior of Africa came reports of its successful use by a former pupil.

In the school and in the hospital he was a constant source of knowledge and of inspiration for better work, not only to physicians and students of medicine, but to that noble class of young women who have made modern nursing rank as a profession.

He shortly became a member of the Association of American Anatomists and of the American Surgical Association, being vice-president of the latter. This membership was particularly creditable to him, for there were at that time but few members in the entire West.

Upon the outbreak of the Spanish war, he went out as major and surgeon of the First Colorado Regiment, and achieved yet higher honors. Of these General Hale has spoken.

Dr. Parkhill deserves particular credit for the great things which he did, being apart from the great centres of medicine, and without the stimulating influence which comes from the intimate association with fellow-workers. Just before he died, Dr. Eskridge told me that what he missed most in Denver was this very stimulus to good work. Parkhill and Eskridge would both have shone more brilliantly under more favorable opportunities for scientific work.

Let me tell you of a little incident which happened a few years ago in Kansas City. One of her prominent surgeons said to Parkhill, "Why is it that your surgeons in Denver operate on

so many cases of brain tumor?" And the reply was, "Because we have a man out there that can make the diagnosis." In his tribute to Eskridge's ability he left out what his modesty prevented him from saying, although equally important, that we had a surgeon who could operate on such cases successfully.

In what did Dr. Parkhill excel in surgery? He was a man of good judgment, of accurate anatomical knowledge, of wide experience, but he was a superb operator. Never in any amphitheatre did more facile hand follow the dictates of a clearer brain. In surgical technique, his brother surgeons acknowledged him easily their leader.

Let us, then, pay our just tribute of respect to the memory of our deceased brother. Let us treasure the memory of his commanding eminence in the operating-room, his invaluable counsel at the bedside, and his charming social qualities; of his enthusiastic energy in the hunting camp, and his recognized services in the field; and, finally, let us proclaim that he was the leader among those brilliant men who gave to the West the revelation of Modern Surgery.

J. N. HALL, M.D.

INDEX TO SURGICAL PROGRESS.

HEAD AND NECK.

I. Cerebral Pressure. By PROFESSOR DR. TILMANN (Greifswald). Tilmann reports two cases of trauma to the head sustained, in one case by a blow from a falling brick, in the other by falling against the angle of a wall. In both cases there were symptoms of compression and no depression of the skull. Ordinarily, under such circumstances, elevation of the head is proper, but here this decubitus was followed by marked increase of the symptoms of compression and no depression of the skull. Ordinarily the best of results.

Effused blood takes up as much room in the skull when the patient lies as when he sits. The elevated position of the head is generally indicated to assist the flow of blood from the brain, and so prevent congestion and the symptoms of severe pressure. In the cases reported, *lowering* of the head improved the condition of the patient. The diagnosis of intradural effusion of blood was practically positive.

To elucidate the problem, Tilmann submitted two questions to experiment:

(1) How much diminution of cranial space must there be before symptoms of compression develop?

(2) Is it possible and conceivable that a change in the position of the head may alter the pressure of blood effused inside the skull, and that the sensorium, unaffected while the horizontal position is maintained, may be involved as soon as the upright position is assumed?

The experiment consisted in reflecting a flap of bone from a dog's skull, placing under it (extradurally) a thin, flat sac of

rubber, from which a rubber tube led to the open air, replacing the bone flap and letting union take place. The dog recovered except for trifling left-sided paresis.

Experiment 1.—Dog laid on left side. Head so placed that top of skull pointed upward.

(a) Injection through the tube of three cubic centimetres warm water occasioned defensive struggles. The addition of a few cubic centimetres increased the struggles and elicited groans and active expiratory efforts. Removal of 1.5 centimetres of water was followed by recovery. The pulse remained at 72, and was unaltered.

(b) Glycerin (specific gravity 1269) was injected. 1.5 cubic centimetres produced struggles, which were violent and accompanied by groans when the amount was 2.5 cubic centimetres. Repetition of the experiment gave similar results.

Experiment 2.—Dog laid on left side, with head hanging over the end of the table.

(a) Injection of water. 4.25 cubic centimetres were required to produce struggles, while 5 cubic centimetres occasioned violent struggles and cries. When finger pressure was removed from the piston of the syringe, it was pressed out until only 4.25 cubic centimetres remained in the rubber sac.

(b) Injection of glycerin. 4.0 cubic centimetres produced struggles. 5 cubic centimetres rapid respiration and groans.

Experiment 3.—Head elevated as in Experiment 1.

(a) Injection of chloroform (specific gravity 1492). 2.3 cubic centimetres produced struggles, 4 cubic centimetres occasioned severe groans and cries.

(b) Injection of benzin (0.65 specific gravity). 4.4 cubic centimetres produced first reaction; with 5 cubic centimetres came cries and rapid respirations. The head was lowered as in Experiment 2.

(c) Injection of benzin. 4 cubic centimetres produced symptoms; 5 cubic centimetres increased symptoms.

(d) Injection of chloroform. 4.25 cubic centimetres produced symptoms, 5.4 cubic centimetres occasioned spasmodic respiration, tremors of the limbs, slowing of the pulse 72 to 56; 6.5 cubic centimetres gave dilated pupils, deep snoring respirations; 7.5 cubic centimetres the cornea was anæsthetic and the pulse stopped. On removal of the syringe, the fluid was forced out in a stream. The dog slept half an hour and recovered.

Experiment 4.—The head elevated as in Experiment 1.

(a) Pulse 96. Glycerin injected. 2 cubic centimetres caused accelerated respiration, 4 cubic centimetres caused struggles, slight cries, pulse 96; 5 cubic centimetres, rapid, deep, spasmodic respiration, pulse 80; 6 cubic centimetres, spasms, dilated pupils, anæsthesia of cornea, pulse 60 to 66. After removal of the fluid, the corneal reflexes and pupils became normal in four minutes.

(b) Water injected. 4 cubic centimetres gave rise to the first symptoms, 8.5 cubic centimetres caused dilatation of pupils and anæsthesia of cornea. The respiration became at first convulsive, then slow and snoring, and then ceased. The pulse sank to 48, and there were general convulsions. In the course of two days there was recovery.

Experiment 5.—Head elevated. Injection of mercury. 1.0 cubic centimetre caused symptoms. The head was now lowered, and the symptoms disappeared. On the addition of 2.0 cubic centimetres of mercury the symptoms reappeared.

It will be noticed in the experiments that the amount of fluid necessary to produce symptoms of compression varies with the specific gravity of the fluid and the position of the head. When the head was lowered, symptoms developed on the introduction of three to four cubic centimetres of fluid, no matter what fluid. When the head was elevated, the heavier the fluid the less was required to produce symptoms (one cubic centimetre mercury, water four cubic centimetres).

When the head is in the lowered position, the fluid acts merely by diminishing the cranial space. In the dog, the brain could tolerate about four cubic centimetres of the cranial space being taken up by the fluid, no matter what the specific gravity of the fluid. As soon as this limit was passed reaction took place, and as soon as five cubic centimetres were injected expiration became active; the return of blood from the head was hindered; the general cerebral pressure was increased to such a degree that on removal of the syringe the fluid was forced out in an arched stream until only four cubic centimetres were left. The remaining fluid only escaped in drops; it was not under pressure.

When the head is elevated, the fluid in the rubber bag presses

directly upon the convexity of the brain, and the specific gravity of the fluid plays its part. Water and benzin are each lighter than the brain and cerebrospinal fluid, hence in the experiment (with head elevated) it took almost as much of these fluids to produce symptoms as when the head was lowered. According to the increase in the specific gravity of the fluids, it took less volume to produce symptoms, *e.g.*, one cubic centimetre of mercury sufficed (the head being high).

The commonest cause of increased cerebral pressure in man is effusion of blood. Blood-clot has a greater specific gravity than the blood or brain tissue, and hence a blood-clot lying on the cortex acts not merely by diminishing the cranial space, but by the direct pressure of its weight. It follows that small clots at the base may give no symptoms, while similar ones on the hemispheres may do so. Small clots pressing directly on important parts of the cortex may give rise to severe symptoms. The severity of the local symptoms gives no key to the extent of the clot, but merely to its location. Hæmorrhage only gives rise to *general* pressure symptoms when it reaches a certain degree. According to different experimenters, from 3 to 9 per cent. of the cranial space may be occupied by foreign fluids before symptoms develop. Tilmann calculates that it must take about seventy-three grammes of blood effused extradurally or at the base to produce general pressure symptoms, but that twenty-eight to forty-two cubic centimetres of blood effused on the convexity of the brain under the dura will produce symptoms. What bearing has the above research on hæmatoma from injury of the middle meningeal artery? When there is an effusion of blood lying between the dura and the bone, the former so supports the blood that its weight does not act directly on the brain below it. The blood acts merely by diminishing the cranial space. In hæmatoma from the middle meningeal artery, the paralytic symptoms often appear simultaneously with those of general pressure in spite of the fact that, owing to location, the motor centres must have been the first

pressed upon. This is due to the fact that the whole of the symptoms are due to diminution of cranial space, local symptoms only arising in the worst stages. In other words, the local pressure is only a part of the general due to the fact that the place where the pressure starts in a closed cavity suffers more than the rest of the contents of the cavity. The same holds good in cases of bone depression and impression so long as the bone is not separated or the dura torn. This explains the absence of symptoms in cases of slight depression.

The cases reported at the beginning of Tilmann's article are types of pure *intradural* hæmorrhage from injury to the veins of the pia. In both cases the sensorium was more affected when the head was elevated; and in one of them there was slight paresis, which disappeared when the head was lowered. From these circumstances, the absence of general cerebral symptoms and the rapid recovery of the patients, it is justifiable to conclude that there was present a slight effusion of blood on the posterior half of both hemispheres (or perhaps only of the right one). When the head was held high, its long axis being horizontal, the effused blood pressed vertically on the cortex beneath it. When the head was lowered, then, according to the law of gravity, the blood-clot pressed on the posterior part of the skull instead of on the brain. When the head was lowered, the blood merely diminished the cranial space, and that insufficiently, to produce symptoms; when the head was high, the weight of the blood-clot produced direct pressure.— *Archiv für klinischen Chirurgie*, lxiv, 93.

II. Resection of Upper Jaw. By PROFESSOR KRÖNLEIN. From an examination of the statistics of well-known surgeons during the past twenty years, Krönlein states that the immediate mortality is now greater than in years gone by. The cause of the increased mortality he believes to be anæsthesia, and urges that we operate either without an anæsthetic or use one merely for the skin incision "*pro suggestione*." Acting as he recommends,

Krönlein has lost only one out of thirty-five patients operated on for carcinoma or sarcoma, and that one died from suppurative basal meningitis.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXX. Kongress, 1901.

JOHN FAIRBAIRN BINNIE (Kansas City).

III. Preliminary Ligation of Common Carotid in Resection of Superior Maxilla. By DR. C. SCHLATTER (Zurich). This procedure has come into vogue because of the severe hæmorrhage attending this operation, and the chances of aspirating large quantities of blood during profound narcosis. The latter is obviated by operating under partial narcosis. The mortality of this operation is variously given. At Göttingen, seventy-four cases; 23 deaths, 31 per cent. At Greifswald, eighteen resections, four deaths, 22 per cent. Bryant's analyses of 230 cases show a mortality of 14 per cent., and author's study of thirty-five cases at Zurich show one death, equal 2.8 per cent. The first record of preliminary ligation was offered by Professor Reyher, St. Petersburg. The common carotid was doubly ligated and divided. To obviate disturbances in cerebral function, one week prior to ligation the common carotid was daily compressed for fifteen minutes, and after the operation a rigid horizontal position was maintained. Twenty-seven ligations were thus executed and one death.

To this Weljaminaw added twenty cases, no deaths, a total of one in forty-seven. V. Lesser then applied a temporary ligature to the common carotid, and, as no cerebral disturbances set in, the ligature was permanently secured. Subsequently, Senger proved experimentally that a temporary ligature of common carotid was possible for a period of one to three hours without harm accruing to vessel or brain. This method was later put into practice by Senger and Shānbom; the former availed himself of this method for hæmostasis in resection, the latter for control of hæmorrhage from malignant growths of superior maxilla. There being no question as to perfect hæmostasis obtained, the moot point raised

is whether cerebral disturbances do not offset this gain, and whether temporary ligation is not more likely to cause them than permanent ligation. The earlier experiments of Eberth and Schimmelbasch proved that the application of a ligature for some time did not cause any subsequent interruption of the circulation because thrombosis did not occur. These facts appertain to animals, and they are far more favorable in man, where rigid asepsis is a greater possibility; yet the remote chance of cerebral disturbance does not justify a universal application of ligature of the common carotid. The ideal solution would be, if ligation of the external carotid would suffice. In this event the ligation could be permanent. Bearing on this procedure, 130 cases collected by Lipps (1882) show that in two instances a thrombus formed eventually, extending into the internal carotid, causing death. Ten years later Lipps (1892) found no greater unanimity among surgeons as to choice of ligation, and this question is yet open. In the endeavor to find a solution, the author resected the superior maxilla in three instances. Once the common carotid was temporarily ligated; in the second instance the external was ligated, and, as hæmorrhage was not perfectly controlled, the internal was constricted, and in the third, the ligation of the external carotid sufficed.

From this personal experience and study of the literature, the author concludes that preliminary ligation of the common carotid spares the loss of blood, and prevents aspiration of the blood. Such ligation is strongly recommended in all patients who are cachectic and anæmic because of the loss of blood, provided there be no arteriosclerosis. An additional reason for the exposure of the common carotid at its bifurcation is that it permits of the extirpation of diseased lymph glands. In most instances ligation of the external carotid suffices, and under antiseptic precautions the procedure is harmless. In exceptional instances the common carotid may have to be ligated, and in that event temporary constriction is less harmful than permanent ligation. But

the author contends that this hæmostasis alone has not robbed resection of the superior maxilla of its chief danger, viz., pneumonia from aspiration, since this latter complication is more likely to follow later on from the aspiration of mucous saliva and wound secretions.—*Beiträge zur klinischen Chirurgie*, Band xxx, Heft 1.

MARTIN W. WARE (New York).

ABDOMEN.

I. Discussion on Appendicitis at the German Surgical Congress. REHN claimed that appendicitis was to be treated according to general surgical rules. Peculiarities of the peritoneum give us no permission to treat inflammatory processes in it in a manner different from the same processes located elsewhere. The fear of infecting the general peritoneum by operating in time is hard to overcome, but is groundless. When a proper operative technique is used, bad results are to be attributed to circumstances, uncontrolled by the surgeon, such as may arise in the course of any phlegmonous inflammation. Rehn considers that his statistics prove that prophylactic operation, not merely between attacks but during them, is thoroughly justified. What does an acute attack of appendicitis mean? In the great majority of cases it means a phlegmonous inflammation affecting the whole thickness of the organ, which is red, turbid, and has its internal pressure increased. Its mesentery is always more or less affected. The inflammation can resolve, sometimes quickly, sometimes slowly; the organ may, either quickly or slowly, completely or incompletely, become gangrenous. If the wall of the appendix becomes permeable, a stage of the disease is reached which is modified according to the position of the organ and the existence of fresh or old adhesions. The outcome of the disease depends on other more essential factors. When infective material gains access to the peritoneum, the occurrence or non-occurrence of peritonitis depends on the amount of the infection, its virulence,

and the bactericidal power of the peritoneum. These circumstances decide whether the result is diffuse peritoneal infection or a slight local peritonitis. Intense irritation around the appendix gives rise to adhesions around the focus of inflammation which contains sometimes serofibrinous material, more frequently pus. At this stage resolution may take place, but, on the contrary, the process may at once, or after a short time, become worse. This is a most critical period, and in many cases is the last chance for successful operation. Delay is only permissible when all the symptoms are ameliorating.

In suppurative appendicitis, Rehn operates as follows: Make an incision large enough to permit a thorough exploration of the inflamed territory. Quickly open the peritoneum. Under thorough irrigation with salt solution separate adhesions, expose and remove the appendix *secundum artem*. Review the inflamed area and neighboring loops of gut. Always drain. Through the drain fill the belly with hot salt solution.

Rehn's opinions as to acute appendicitis are as follows: Internal treatment is valueless. Statistics show that many cases undergo resolution. This fact does not help the physician in those which do not recover. Many obscure and dangerous inflammatory processes can be traced back to a so-called cured appendicitis. A first attack should always, especially in children, be treated with the greatest concern. Doubtful cases should undergo operation. Early operation is imperative, if the attack begins with severe local and general symptoms, *e.g.*, a rigor. Here no one dare expect peri-appendicular adhesions. Operation is all the more demanded if the trouble is *not* in its classical site. "Removal of the appendix in the beginning of an acute attack is the only sure means of lowering the mortality to a minimum." When operation is delayed, extreme watchfulness is necessary during the course of the disease, lest the conditions become worse, and most remarkable skill is often required to recognize such changes at an early stage. Some appendicular diseases kill in

the shortest time, others lead into the gravest danger without giving rise to marked symptoms.

The question of the treatment of recurrent acute attacks of appendicitis is simple. As soon as it is recognized that an operation at the beginning of an attack is not more dangerous than in the intervals, all surgeons will operate early. Early operation is as easy, often easier, than one in the intervals, and it is certainly not more dangerous.

SONNENBURG. Mülham, on behalf of Sonnenburg, submitted the following theses on the anatomical diagnosis in perityphlitis:

(1) Sonnenburg seeks to connect all the symptoms observed during life with the anatomical changes in and around the appendix.

(2) The unity of the clinical view must be established by a corresponding unity of the anatomical conditions.

(3) Experience shows that, of all the cases of perityphlitis, only those in which the appendix is gangrenous demand immediate operation.

(4) Appendicitis perforativa and simplex are not so *foudroyant*, and, as a rule, become encapsulated.

(5) The forms of gangrenous appendicitis demanding operation in the first twenty-four hours of their course are to be recognized by severe general disturbances (symptoms of general infection, high pulse-rate, expression of grave illness, great local tenderness, absence of clear resistance in caecal region, evidences of general peritonitis).

(6) If one operates within twenty-four to forty-eight hours from the beginning of the attack, one finds in this class of cases a gangrenous appendix surrounded by non-encapsulated gangrenous and purulent exudate; in the rest of the peritoneal cavity there is present turbid fluid. After evacuation of the primary exudation, the disease either progresses farther, or there forms extensive encapsulation in the belly, especially in the sub-phrenic region and in Douglas's pouch. These threaten the patient's life once more.

(7) Perforative appendicitis does not progress with grave symptoms of general infection. The pulse-rate corresponds to the fever. Local resistance showing an encapsulated exudation is present, which may, after days or weeks of waiting, call for operation.

(8) When perforation of the appendix takes place directly into the peritoneal cavity the symptoms and treatment are the same as in the gangrenous variety.

(9) In appendicitis simplex, operation is only proper when there is empyema of the organ. This may be recognized by the great tenderness and the absence of symptoms of general toxæmia, and especially by the absence of high temperature and rapid pulse. As such empyemata lead to gangrene or perforation, immediate operation is demanded.

(10) Conclusions.

(a) Operation between attacks is to be preferred.

(b) In appendicitis simplex operation during the attack is rarely required, and then only when there is empyema.

(c) In appendicitis perforativa, operation is demanded, during the attack, in carefully selected cases.

(d) In appendicitis gangrenosa, immediate operation is always demanded.

(e) Appendicitis perforativa and gangrenosa with complications always demand operation.

SPRENGEL (Braunschweig) has become an ardent supporter of early operation. If the relative safety of early operation is substantiated (the author believes it is), it becomes necessary to revise the indications for the operations performed during the intervals between attacks. The interval operation is only safe in uncomplicated cases. When complicated, it becomes a most difficult laparotomy. Sprengel advises that one only operates during the interval after a slight attack of short duration; if the attack has been severe, operation should be delayed until a fresh attack begins, and be performed within the first two days of the illness.

—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXX. Kongress, *Centralblatt für Chirurgie*, 1901, No. 29.

II. Perihepatic and Pleural Complications of Appendicitis. By DR. L. LAPEYRE (Tours). The author has contributed an extremely interesting and instructive essay on the above subject, a subject too much neglected in our literature. How do the lesions extend from the appendix to the liver and pleura?

There are three routes of possible extension: (a) The cellular; (b) the parietal lymphatic; (c) the peritoneal. [The metastatic abscesses in pyæmia are, of course, not referred to in this discussion.] The author believes that the infection is carried along the peritoneal route, although he does not deny that the parietal lymphatics may be involved in the process. Robinson declares that the pus follows the parietocolic pouch upward to the suprahepatic region. The parietocolic pouch is a sort of gutter bounded externally by the posterolateral abdominal walls, internally by the outer surface of the cæcum and ascending colon. It begins at the appendix and runs upward to terminate at the lower surface of the liver in a cavity capable of holding much fluid and of being isolated. This cavity is bounded as follows: *Above*, by the inferior surface of the right lobe of the liver and by the gall-bladder; *below*, by the right flexure of the colon and by the transverse colon; *behind*, by the right kidney; *internally*, by the duodenum, the foramen of Winslow, the right border of the lesser omentum. It communicates *below* with the right parietocolic pouch; *above*, with the right subphrenic space; *inward*, with the lesser peritoneal sac. The contents of this subhepatic space may escape through the foramen of Winslow or into the subphrenic space. The horizontal position favors extension of inflammation from the subhepatic to the subphrenic spaces rather than to the lesser peritoneal cavity, as the foramen of Winslow is easily obliterated by inflammation, and is situated anterior to

the vertebral column. Cases of extension into the lesser peritoneal cavity have been published. Gravitation of pus from appendicitis may take place into the pelvis when the appendix is located below and to the inner side of the end of the cæcum; when the appendix is above and posterior to the cæcum, the inferior ligament of the cæcum (mesocolon) prevents the pus from going downward, and directs it into the parietocolic pouch. The pus once in the parietocolic pouch follows the parietal peritoneum more readily than the visceral, and thus easily reaches the under surface of the diaphragm.

The author concludes:

(a) The disease extends uninterruptedly along the retrocolic (parietocolic) pouch.

(b) The pus is arrested below by the inferior ligament of the cæcum, above by the falciform ligament of the liver. Above the colic flexure the pus may be arrested in a sort of transverse pouch (subhepatic pouch), and may escape thence into the subphrenic space or the lesser peritoneum. The pus rarely escapes through the foramen of Winslow. Pleurisy (right sided) is the result of perforation of the diaphragm or of lymphatic infection.

Symptomatology.—Eliminating all other causes of pleurisy, the clinical history of suppurative sub- or supraphrenic complications of appendicitis may be traced as follows:

The initial symptoms are those of an acute appendicitis.

Pain at McBurney's point, vomiting, constipation, elevation of pulse, and generally of temperature. There is no relation between the severity of the appendicitis and the occurrence of complications. Often at the end of forty-eight hours peritoneal obstruction manifests itself. The hepatophrenic complication does not suddenly succeed the obstruction, but is always preceded by symptoms of localization in the right iliac fossa with invasion of *all* the right side of the belly cavity from ilium to hypochondrium. The temperature and pulse are elevated, and there is a feeling of malaise with or without vomiting. By the fourth or

eighth day the hepatophrenic stage is well developed, and the following symptoms are noted: The facies is of the peritoneal type; there is respiratory anxiety; the temperature varies from 38.5° to 39° C. (101° to 104° F.), with exacerbations at night. The pulse is small, bad, rapid, and depressible. The pain is severe, piercing, and most marked at the level of the right hypochondrium. It frequently radiates to the right shoulder. Dyspnoea is intense, and there is a tendency to cyanosis. A stitch in the side and a painful, dry, incessant cough, indicating not pleurisy, but inflammation beside the diaphragm. The physical signs vary according as the disease is sub- or suprahepatic. When subhepatic, one may notice œdema of the abdominal wall and a deep induration under the false ribs. Occasionally fluctuation is present. The dulness over the disease is continuous with that of the liver, which appears increased in volume. In the suprahepatic variety (which is the commoner) there is rarely œdema of the parietes, and no induration under the false ribs is palpable. It is easy, however, to recognize the induration filling the right zone of the abdomen from the iliac region to the hypochondrium, and this demonstrates the advance of the abscess. Percussion and auscultation give results similar to those in pleurisy. When pleurisy supervenes, the symptoms become worse, but are not different in kind. The treatment advised is, of course, operative. —*Revue de Chirurgie*, April and May, 1901.

GENITO-URINARY ORGANS.

I. Freezing Point of Blood and Urine in Renal Surgery.

By DR. O. RUMPEL (Hamburg). This recently acquired physical method is a reliable means of determining the function of the kidney expressed in the freezing point of the quality of urine secreted. This latter varies with the degree of molecular concentration of urine; and, again, any variation in the molecular concentration of the urine in the kidney, according to the laws of osmosis, causes a like variation in the molecular constitution of

the blood, thus in turn affecting its freezing point. The conclusions arrived at on the basis of the application of this method to normal and pathological cases are: The osmotic pressure of normal blood shows a freezing point of -0.56° C.; fluctuations of -0.55° to -0.57° C. are within physiological limits. A lowering of the blood-freezing point signifies a disturbance of renal function. The latter may be transient, due to congestion, dependent on cardiac insufficiency, or permanent, due to organic changes. Disturbances of metabolism due to increased splitting up of albumen are capable of increasing osmotic pressure of blood. Prior to every surgical intervention in renal affections, it is advisable to ascertain the freezing point of blood and urine, and gain from these an insight into the renal functional activity. With a blood-freezing point of -0.56° C., the diseased kidney can be removed without risk as to the functional capabilities of the normal kidney. With a lowering of the blood-freezing point below -0.58° C., any surgical interference of the kidney must be conducted with great caution. If the lowering of the blood-freezing point traceable to other possibilities (congestion, increased disintegration of albumen due to neoplasm) can be ruled out, extirpation of the kidney is unsafe and dangerous. The freezing point of normal urine fluctuates between -0.9° C. and 2.2° C., varying with the metabolic changes. A permanent lowering of the freezing below -0.9° C. conclusively points to renal insufficiency. Both kidneys do not produce like quantities of urine in like time, yet, under normal conditions, the molecular concentration of the renal secretion is approximately equal, at least as far as osmotic pressure is concerned. The safest method of examination for the comparative determination of renal functional activity is the physical and chemical examination of urine drawn from each kidney with the ureteral catheter.—*Beiträge zur klinischen Chirurgie*, Band xxix, Heft 3 (Schluss).

II. Practical Experiences in the Diagnosis and Treatment of Renal Diseases. By DR. H. KÜMMELL (Hamburg).

As a result of numerous observations in health and disease, it may be considered proved that the freezing point of normal human blood is -0.56° C. below that of distilled water. Variations of two one-hundredths degrees are physiological. A fall of the freezing point from -0.58° to 0.60° C. indicates renal insufficiency, and no operation may be undertaken until it has reached about -0.56° C. The conditions are different when malignant or benign tumors of the kidneys or abdomen are present, or if there are uncompensated heart lesions.

Out of sixty-five patients examined (cystitis, furunculosis, paranephritic abscess, etc.), in only four was the freezing point -0.55° C. and in four -0.57° C. In typhoid, even in bad cases with high fever, the freezing point of the blood remained within normal limits. (This contradicts the results obtained by Waldvogel in Epstein's clinic.) Recognition of the freezing point of the blood plus examination of the urine obtained by the ureteral catheter gives great exactness in renal diagnosis. The urine must be examined as to its freezing point, amount of urea, amount of sugar passed after administration of phloridzin. Of course, the urine is collected from each kidney separately, and the results of examination compared. The less the freezing point of the urine (*i.e.*, the less it is below that of water) and the less the urea from the diseased kidney, the greater is the destruction of renal tissue. In one case, where the freezing point of the urine was -0.14° C. and only traces of urea were present, the kidney was found to be a mere sac full of stinking pus and stones. While acting on the results obtained by the above means of examination, Kummell has never observed a case of anuria following nephrectomy. Such anuria can follow operations, however, when the opposite kidney was healthy before operation. E. Fränkel has shown that, owing to the operation, and more especially the anæsthetic, there develops a severe degeneration and unclear death in the renal epithelium and glomeruli without any macroscopic evidence of disease. This degeneration is not

confined to cases of renal surgery, and throws light on the so-called reflex anuria.

A blood-freezing point of -0.59° to -0.60° C. and more indicates renal insufficiency, and operation should be postponed until it becomes -0.56° C. The correctness of this view is proved in Kümmell's twenty-two cases of renal insufficiency. In most of the cases the disease proved to be advanced contracted kidney; in some there was uræmia with a blood-freezing point of -0.71° C. In renal insufficiency the freezing point of the urine generally remains less than -0.9° C. The question of the diagnosis of chronic nephritis, etc., is of much surgical importance on account of differential diagnosis. Kümmell has often been saved from otherwise inevitable error in diagnosis by the above means.

Korányi has shown that a lowering of the freezing point of the blood is present in cases of large renal tumors, whether benign (pyonephrotic, etc.) or malignant, or of tumors of other abdominal organs. Kümmell substantiates this observation. This fact is important because, under such circumstances, the blood-freezing point is lowered while the kidney function persists. Of course, here exact examination of the urine as to freezing point, urea, etc., will prevent error.—*Verhandlungen der deutschen Gesellschaft, Centralblatt für Chirurgie*, July 20, 1901.

III. Immediate Suture after Suprapubic Cystotomy. (Jonnescio's operation.) By DR. BALACESCU. *Preliminary Treatment.*—For from three to six or more days prior to operation give salol or urotropine internally. Irrigate the bladder with permanganate solution (1 to 2000) or, especially when there is cystitis, nitrate of silver solution (1 to 5000). Empty rectum, and immediately before operation wash the bladder with a 4 per cent. solution of boracic acid or with nitrate of silver (1 to 1000).

Evacuate the Bladder.—Step 1. Stand on the patient's left. Make a median vertical incision six to ten centimetres (two and a half to four inches) long, immediately above the pubis. Open the prevesical space. Expose and pull upward the fold of peri-

toneum. Recognize the bladder from its vessels and consistence. (It is empty.) With the fingers separate the peritoneum from the vertex and from a little of the posterior wall of the bladder. This is easy and harmless. Do not separate the bladder from the posterior surface of the pubes.

Step 2. Lift the bladder into the abdominal wound by means of thick catgut threads or toothed forceps. (These must only involve the muscular walls of bladder, not the mucosa.) Protect the abdominal wall with gauze. Layer by layer cut through into the bladder. This incision is four centimetres long, begins on anterior bladder wall, and ends on posterior. Explore the bladder with eye and finger. Remove any stones. Through the bladder pass a catheter which is to be left in place. (This is by no means necessary.)

Step 3. Lift the left side of the bladder wound between the finger and thumb and cut away a strip of mucosa one to one and a half centimetres wide, the whole length of the wound, leaving the muscosa intact as a flap. With the finest catgut sew the *mucous membrane* of the left side of the wound to that of the right side. With fine catgut suture the muscularis of the right side of the wound to the under side of the muscular flap at its base, thus covering the line of suture in the mucosa. It is of prime importance to close the upper and lower angles of the wound securely; hence the first stitch at the lower end of the wound should pick up the muscular tissue immediately below the angle, and thus pull the muscular flap over the angle. The same procedure should be adopted at the upper angle. Suture the free edge of the muscular flap to the surface of the bladder. Close the abdominal wound without drainage.

After-Treatment.—For seven to eight days use permanent catheter, or pass catheter three times a day, or let the patient pass water voluntarily. All these methods have been used. In but one case out of twelve was there any leakage, and that was due to faulty technique.—*Centralblatt für Chirurgie*, June 22, 1901.

MARTIN W. WARE (New York).

FRACTURE OF THE BASE OF THE FIFTH METATARSAL BONE BY INDIRECT VIOLENCE.

By ROBERT JONES, F.R.C.S.,

OF LIVERPOOL,

SURGEON TO THE ROYAL SOUTHERN HOSPITAL, LIVERPOOL.

SOME months ago, whilst dancing, I trod on the outer side of my foot, my heel at the moment being off the ground. Something gave way midway down my foot, and I at once suspected a rupture of the peroneus longus tendon. By the help of a friend I managed to walk to my cab, a distance of over 300 or 400 yards. The following morning I carefully examined my foot and discovered that my tendon was intact. There was a slight swelling over the base of the fifth metatarsal bone. I endeavored to obtain crepitus and failed. A finger on the spot gave exquisite pain. Body pressure on the toes, even the slightest, was painful; but when the pressure was deviated to the outer side the pain was still greater. Extension of the ankle and flexion of the toes were immediately felt at the base of the fifth metatarsal.

I hobbled down-stairs to my colleague, Dr. David Morgan, and asked him to X-ray my foot. This was done, and the fifth metatarsal was found fractured about three-fourths of an inch from its base. (Fig. 1.)

I could recall many cases which had come to me with similar symptoms arising from the transmission of body weight to a foot during the position of equino varus. In most cases I had in robust fashion vainly searched for crepitus; in all, the disability lasted several weeks.

I had scarcely recovered, when I saw a young man of thirty years with Dr. Floyd, of Birkenhead. He had been away fishing, and stepping from stone to stone he placed the whole of his body weight upon an inverted foot. He felt, as he said, something

crack in his ankle, and he limped towards his house. The symptoms were identical with my own, and the radiograph showed a precisely similar picture. (Fig. 2.)

A week later, a man of fifty-four years was sent to me from Southport on account of an injury which befell him ten days earlier. He had run to catch his train, twisted the outside of his ankle, and almost fell. He struggled on, however, caught his train, and for some days transacted his business. He had considerable pain, and could scarcely walk by placing pressure on his heel and inner foot alternately. There were swelling and ecchymosis over the metatarsal base, most of which had shown itself some days after the accident. There was pain over the metatarsal base; no crepitus. By this time I could indulge in a positive diagnosis; and I confirmed its accuracy by an X-ray plate. (Fig. 3.)

A fortnight later a powerful looking man of fifty years called upon me. He told me that he had been walking up an inclined plank which yielded, and his foot twisted inward. The injury was painful, but he worked all day, and called on me the following morning. The symptoms closely resembled those I have previously described. I could feel no crepitus, but Dr. Morgan did when manipulating the foot for radiography. The lesion was again found to be just beyond the metatarsal base. (Fig. 4.)

During the same period, Dr. Holland has twice radiographed the same fracture. In one case a lady of fifty years slipped off a step and fell, but no adequate history has been supplied. The fracture, however, is in the same place. (Fig. 5.)

The other patient is one of Mr. Newbolt's, and occurred at the age of sixteen. This patient was submitted to direct violence of a very severe kind, sustaining many injuries to the foot. The only point in common between this and the other cases is that the fifth metatarsal fracture is almost identical. (Fig. 6.)

Now, it is obvious that this fracture is very common, otherwise one would not be able to meet so many cases in so short a time. There is, however, as far as I can find, no reference to it in surgical literature.

For many years I have heard the symptoms of this accident related to me, and, although I often suspected a fracture, it was quite impossible to demonstrate it. The symptoms are



FIG. 1.—Fracture near the base of the fifth metatarsal bone. Case 1.



FIG. 4.—Fracture near the base of the fifth metatarsal bone. Case 4.

pain when the patient endeavors to put pressure on toes or inner side of foot, when he fixes the toes, or attempts to invert. The swelling is generally localized over the fractures, and pain is sharp. There is generally no crepitus, no deformity, no yielding on manipulation. The history of the accident is important because it is sufficiently constant to form a factor in the diagnosis. It is a cross-breaking strain directed anteriorly to the metatarsal base and caused by body pressure on an inverted foot while the heel is raised. The fracture is therefore an indirect one. I emphasize this because H. Morris states, "Fractures of the metatarsals are always the result of direct violence." Hamilton, who does not record an instance of this fracture, states, "The metatarsal can scarcely be broken except by a direct blow." Scudder, in his new work, states, "This fracture is caused by direct violence," and Gould and Warren refer only to severe crushing injuries as a cause of metatarsal fracture.

If we briefly look at the anatomy of the bone, more light will be thrown upon the mechanism of its fracture. The prominent base of the fifth metatarsal is closely bound to the cuboid and to the fourth metatarsal by strong ligaments on every side. So powerful are these ligaments that dislocation of the base is the rarest of accidents. It is obviously easier to break the bone than to dislocate it. When the heel, therefore, is off the ground, the body weight expends itself upon the fifth metatarsal, rotating it slightly inward. The opposition to this force takes place at its base, where the strongly attached ligaments resist its displacement. A fracture occurs, therefore, exactly where one would expect it to occur, and where our skiagrams illustrate.

Cremitus is not felt, probably because the line of fracture runs towards the interosseous ligament and the fragments are therefore fixed, or because impaction may occur. As reference to the skiagrams will show, all the lines of fracture cannot be traced quite through the bone, but there can be but little doubt that the fracture is complete. The difficulty in tracing the

fracture line, added to the fact that, like a wedge, it is wider to the outer side, is suggestive of impaction.

There are doubtless mechanical laws which render it easy to localize its site, as is the case in a Colles's or a Pott's fracture, or even in the interesting one of the outer end of the clavicle, governed as it is by the conoid and trapezoid ligaments.



FIG. 5.—Fracture near the base of the fifth metatarsal bone. Case 5.



FIG. 6.—Fracture near the base of the fifth metatarsal bone. Case 6.

STUDIES IN THE PATHOGENESIS OF APPENDICITIS.¹

By SIMON PENDLETON KRAMER, M.D.,

OF CINCINNATI.

THE vermiform appendix is the rudimentary remains of the prolonged cæcum of the lower herbivorous animals. This may be very well seen in the embryo, in which the appendix is found as a direct tapering prolongation of the head of the colon. With the development of the human individual, the appendix remains behind in growth, so that while in the embryo the proportion of its length to that of the large intestine is as one to ten, in the adult it is as one to twenty.

The appendix, like the colon, is made up of a serous coat, a muscular coat of transverse and longitudinal fibres, and a mucous membrane. The latter is closely packed with tubular glands, between which is deposited lymphoid tissue. The entrance from the cæcum is partially guarded by a fold of mucous membrane,—the Gerlach valve. The appendix is more or less restricted in its movements by its mesentery, which does not extend to the tip, and which, as a rule, is of such dimensions as to curl the appendix more or less upon itself. The blood supply is received from a branch of the superior mesenteric artery, which, with the veins, nerves, and lymphatics, runs along the free border of the mesentery, sending off branches which encircle the appendix, penetrating to the different coats. In the female, the appendix is said to be further supplied by a blood-vessel running in the appendiculovarian ligament.

The section of a normal appendix shows the following structures in the mucous membrane: A complete circle of sim-

¹ Read before the Academy of Medicine of Cincinnati, November 12, 1900.

ple tubular glands lined with columnar epithelium, a continuation of the Lieberkuhn follicles of the large intestine, embedded in lymphoid tissue. In places this lymphoid tissue is more abundant, producing the appearance of lymph follicles. This is much more marked in cases of slight inflammation when the lymph follicles become enlarged and stand out prominently.

The blood supply of the mucous membrane is of extreme interest to the pathologist. Just as is the case in the large intestine, the capillaries encircle the tubular glands, penetrate to the epithelium at the internal surface, and encircle the mouths of the tubular glands just beneath the epithelial lining. (Fig. 1.)

According to modern views, inflammation of the appendix is due to bacterial infection. With the exception of the comparatively rare cases of specific infectious disease, such as typhoid fever, tuberculosis, and actinomycosis, we cannot say that appendicitis is due to any definite germ. The one most constantly found is the *bacillus coli communis*, and as a rule, when present in these cases, it is found to be of more than ordinary virulence. However, since this micro-organism is a constant inhabitant of the normal appendix, there must be certain predisposing, or better called determining, factors in the causation of the disease that are of infinitely more importance to us than the micro-organism.

We may justly assume that the appendix is a functionless vestigial organ, its tissue having less resistance to any infection. When we consider its situation, hanging to the end of the cæcum, often curled upon itself, receiving its nutrition through a single vessel running along the outer border of its mesentery, we can readily understand that it must often be subjected to alternating periods of anæmia and hyperæmia. If such a disturbance of circulation cause a superficial destruction of epithelium, we would have a condition favoring the invasion of the mucous membrane by the *bacillus coli communis*. The character of the inflammation produced is strikingly like that which is caused by a micro-organism closely allied to this, namely, the typhoid bacillus. A section of such



FIG. 1.—Section of a normal appendix; artery injected with Prussian-blue gelatin, showing distribution of capillaries at the surface and around the tubular follicles.



FIG. 2.—Section of appendix with acute inflammation, showing enlargement of the lymphoid tissue causing an almost complete occlusion of the canal.



FIG. 3.—Section of the same appendix as Fig. 2, but taken from a different part, showing clearly cut ulcer at A.



FIG. 4.—Section of appendix showing hæmorrhage in the submucosa at H.

an appendix will show the lymph follicles hyperæmic, greatly enlarged, at times almost occluding the lumen of the organ. (Fig. 2.)

At a later stage, just as is the case with the Peyer's patch in typhoid fever, these enlarged nodules may break down, giving rise to clearly punched-out ulcers. These ulcers are, as a rule, limited to the mucosa, but may perforate the muscular and peritoneal coats. It is the belief of the writer, however, that most of the cases of perforative appendicitis are brought about in a different manner, as will be spoken of later. (Fig. 3.)

Occasionally we may have an erosion of a vessel and a hæmorrhage into the appendix, or beneath the mucosa. Such a case is illustrated by Fig. 4, taken from a case operated upon by the writer, in which this submucous hæmorrhage was the only macroscopic lesion found.

The individual may pass through a number of such attacks of acute inflammation ending in recovery from the attacks, and leaving behind very little trace other than a chronic swelling of the lymphoid structures of the appendix.

In those cases in which we have a foreign body, or a particle of hardened fæces, finding its way into the appendix, the process is different. Here the disease partakes of the character of a catarrhal or desquamative inflammation which leads to the formation of concretions. A section of such an appendix through the concretion will show that at least the outer half, and in many cases nearly all, of the concretion is made up of closely packed cast-off cells cemented together with mucus. A small particle of hardened fæces or a foreign body may form the nucleus. These cells are derived from the cast-off epithelial cells lining the appendix and tubular glands and the exuded lymphocytes. The cells will be seen to be gradually losing their staining power as one passes towards the centre of the concretions; that is, the older or central cells have lost their chromatic substance, the younger or peripheral cells, being but recently cast off, retain it. (Fig. 5.)

Such a concretion by pressure exerts a deleterious influ-

ence upon the blood-vessels of the mucosa, compressing the superficial capillaries, thus bringing about the death of a new layer of cells, which become in turn a part of the concretion. In this way we may have a progressive enlargement of the concretion at the expense of the wall of the appendix, until by pressure we may have at some point all of the capillaries occluded; there then follow necrosis and perforation.

This theory of the causation of perforation of the appendix is borne out by the fact that in the vast majority of instances the perforation takes place in those parts of the organ farthest removed from the entrance of the blood supply; points where the nutrition is probably least, namely, in the wall opposite the attachment of the mesentery, or in that portion of the appendix without a mesentery,—the tip. These changes and the destruction of capillaries by a concretion are very well shown in the following two figures (Figs. 5 and 6) made from two sections of an injected appendix containing concretions. In Fig. 5 the section was made through the centre of the concretion, and one may observe how the surface capillaries have been obliterated, and more especially on the side opposite the mesenteric attachment. One may also see how much thinner is that portion of the wall.

Fig. 6 is drawn from a section of the same appendix made just at the tip of the concretion. One may see that the surface capillaries are still preserved, although the appendix is also here thickest at the side of the mesenteric attachment.

The ultimate cause of the formation of these concretions is probably to be sought for in a functional defect of the appendix. This is the lack of peristalsis, and therefore the inability to get rid of a foreign body, a particle of hardened feces, or inspissated mucus. Although the appendix has a well-developed muscular coat, there has still been a question as to whether it has this peristaltic action. Experiments upon lower animals cannot be applied to man in this instance, because the appendix is of much less functional importance to man than to the lower animals.

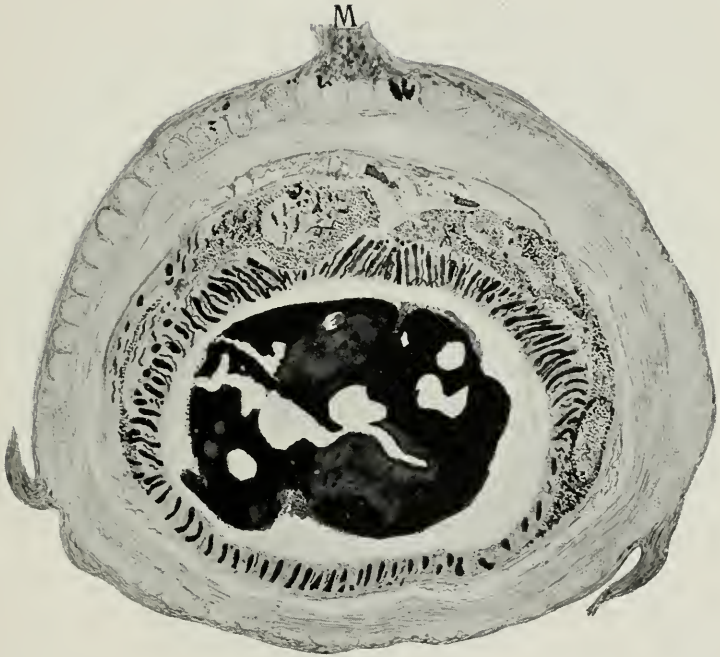


FIG. 5.—Section of an injected appendix through a concretion, showing the cellular character of the concretion, the destruction of capillaries by pressure, more marked on the side opposite the mesenteric attachment, and the thinning of the wall on that side.

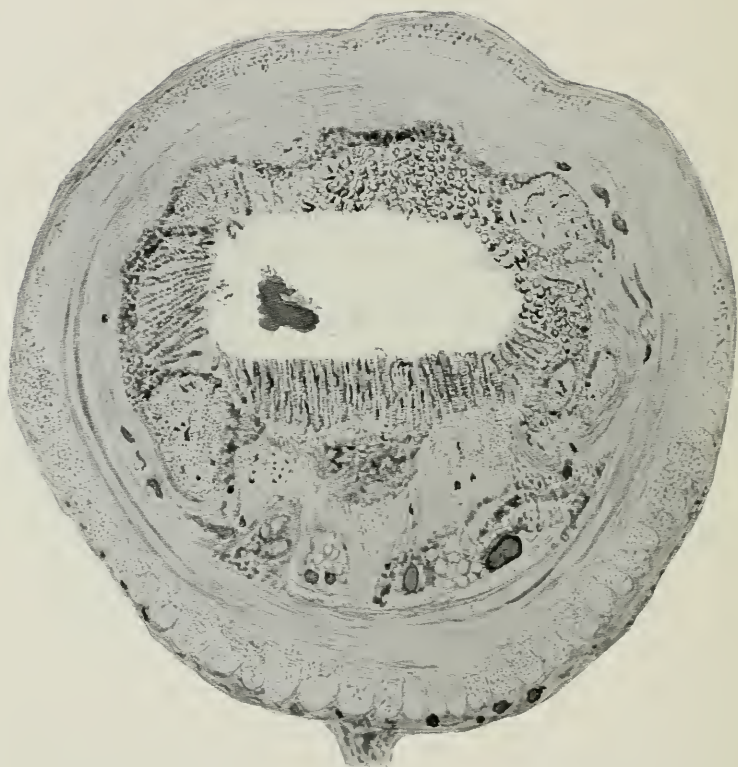


FIG. 6.—Section from the same appendix as Fig. 5, made just beyond the tip of the concretion.

In order to determine this point in the human subject, I have applied faradic irritation directly to the appendix *in situ* in two cases of appendicectomy. This was done with sterile platinum electrodes attached to a Du Bois Raymond apparatus, with the coils at such a distance that the current was distinctly felt when applied to the tip of the tongue. The experiments were done in two cases of mild catarrhal appendicitis in young women. In neither case after repeated application of the current was there the slightest sign of peristalsis. Microscopic examination in both cases after removal showed a well-developed muscular coat.

If the absence of peristalsis be now assumed, and we have a foreign body, particle of inspissated mucus, or faecal matter in the appendix, we can understand how these concretions are formed. By its mere presence the body in question sets up a slight catarrhal inflammation with desquamation of the lymphocytes and superficial epithelial cells. The secretion of mucus is increased, and the cast-off cells become cemented to the original particle, the fluid portion of the exudate being absorbed by the lymphatics. The body being now larger becomes more of an irritant factor; the desquamation goes on, the enlargement of the concretion progresses, and we have a vicious circle established.

Attention is further directed to a form of appendicitis which, according to very competent authority, is not an inflammatory process, and that is the so-called obliterating appendicitis. Not at all infrequently we remove appendices for symptoms of appendicitis, or find at the post-mortem table, in cases where no disease had been recognized during life, an appendix which has either become converted into a fibrous cord, or one in which at different points the canal has been obliterated; at other points the lumen has been more or less imperfectly preserved.

Fig. 7 is from a section illustrating the latter condition. The canal has become partially obliterated by bridging bands of fibrous tissue, and nearly all of the glandular structure of the appendix has disappeared. This appendix was obtained

post-mortem from a man who showed no symptoms of disease of the appendix during life.

Fig. 8 was made from a section of an appendix which I removed for well-marked symptoms of appendicitis. The appendix had been converted into a fibrous cord, the canal being completely obliterated.

Ribbert regards these obliterating changes as a normal "Rückbildung" or degeneration, and not of inflammatory origin. He describes the process as one of atrophy of the glandular structures, consequent approximation of the sides, and, finally, a growing together of the submucosa. Of 400 appendices examined by him at the autopsy table, he found that ninety-nine, or nearly 25 per cent., had undergone this change. Of the adults examined, it was found in 32 per cent. of the cases. The following list gives the percentage of cases in which these obliterating changes were found at different periods of life:

One to ten years, 4 per cent.; ten to twenty years, 11 per cent.; twenty to thirty years, 17 per cent.; thirty to forty years, 25 per cent.; forty to fifty years, 27 per cent.; fifty to sixty years, 36 per cent.; sixty to seventy years, 53 per cent.; seventy to eighty years, 58 per cent.

He never found this condition in the newly born. The youngest child in which this obliteration was found was five years old.

So far as my own experience goes, I can say I have operated in cases having marked symptoms of appendicitis, have found the appendix a fibrous cord, and the operation followed by a cessation of symptoms. Section of such an appendix showed evidence of inflammation in the presence of a large number of small, round, inflammatory cells in the tissue causing the obliteration. (Fig. 8.)

In other cases I have found these changes post-mortem in cases showing no symptoms pointing to disease of the appendix during life. A complete obliteration of the cavity of the appendix is a conservative process and does away with the

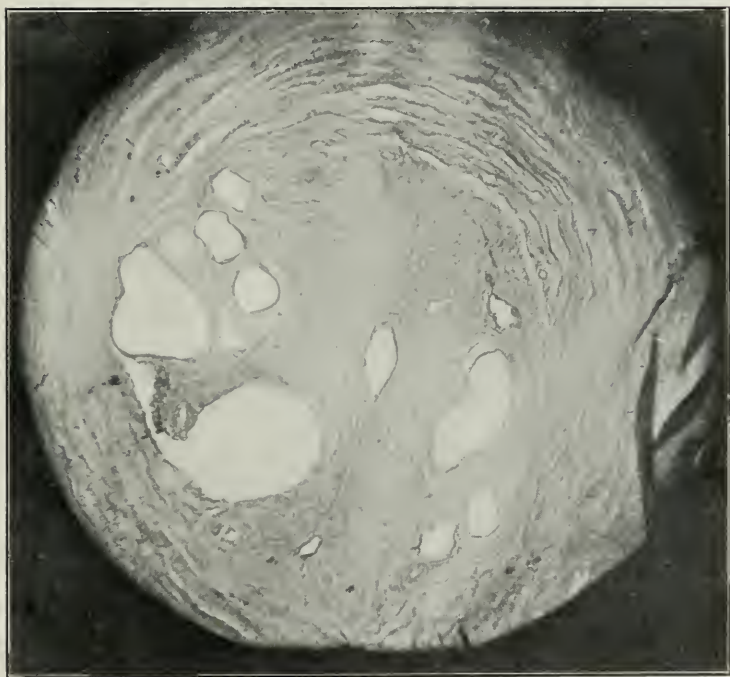


FIG. 7.—Section of appendix with partially obliterated canal.



FIG. 8.—Section of appendix with the canal totally obliterated. Section taken from a case in which the appendix had become converted into a fibrous cord.

danger to life from perforation. Yet probably these cases will continue to be operated upon for the relief of symptoms.

Another question worthy of discussion in connection with this subject is that of the existence of a stercoral typhlitis. Three decades ago, before the vermiform appendix occupied such a prominent place in surgical pathology, many cases of inflammation in the ileocæcal region were ascribed to the accumulation and stasis of fæcal matter in the cæcum, giving rise to an inflammation that extended to the peritoneum. To-day the existence of such a condition—stercoral typhlitis not having its origin in the appendix—is denied by many. The report of the following case is not without interest.

A. M., a young woman aged nineteen, was admitted to the hospital, August 7, 1900, with a history of three previous attacks. The last attack was on July 24, 1900. At the time of entrance there was marked tenderness over McBurney's point, constipation, and a sense of swelling on palpation in the ileocæcal region. On August 13, laparotomy was performed for the purpose of removing the appendix. The cæcum was found to be adherent to the adjacent peritoneum on all sides, and when these adhesions were separated, the appendix, of foetal type, was found in its normal site, absolutely free from any adhesions and apparently normal in every respect. The appendix was removed and microscopic examination showed no disease. The girl made an uninterrupted recovery, was discharged after eighteen days, has remained absolutely well ever since, and has gained twenty pounds in weight.

The question is, whether these adhesions had formed about the cæcum as the result of an inflammation in that organ, or whether the process had started in the appendix, had extended to the cæcum, the appendix in the meantime having regained its normal structure. On account of the absolute freedom of the appendix from adhesion and from all microscopic evidence of disease, the writer is inclined to take the former view.

CLINICAL OBSERVATIONS ON THE SURGERY OF THE GALL-BLADDER.¹

BY ALBERT J. OCHSNER, M.D.,

OF CHICAGO.

A FEW suggestions of much importance must be touched upon in order to obtain a sufficient amount of time to dwell on that which is of practical value.

In order to comprehend the conditions one finds in the treatment of diseases connected with the gall-bladder, it is important to bear in mind its anatomical relations as well as its mechanical provisions, because, so long as its anatomical relations are normal and the organ is mechanically approximately perfect, there is no occasion for treatment, because the gall-bladder becomes distended with bile, which is a non-irritating fluid and empties itself. These functions give rise to neither pain, irritation, nor discomfort.

Normally, the gall-bladder is suspended from the lower surface of the liver as a very slightly distended pyriform sac, which empties its fluid rapidly into the duodenum if slightly irritated. The muscles of the gall-bladder are very active and well able to empty the contents.

It seems to have been proved beyond a doubt (Charcot and Gambault) that this pouch shares the fate of all similarly constructed organs in the body,—the stomach, the urinary bladder, the pelvis of the kidney; so long as there is nothing to prevent these organs from emptying their contents they are almost certain to remain normal, but so soon as an obstruction occurs, interfering with the natural emptying of the organ, trouble is likely to ensue.

¹ Read before the Chicago Surgical Society, January 6, 1902.

In other words, an interference with the drainage is sure to cause a certain amount of residual substance which makes the accumulation of bacteria possible, and from this accumulation we must expect injury to the lining of the organ, which may simply be catarrhal at first, but which will later become destructive to the mucous membrane, giving rise to the formation of ulceration, and this in turn will result in cicatricial contraction and further obstruction. In this manner the condition must progress from bad to worse.

In the mean time the mucus and *débris* in the gall-bladder may have been moulded into gall-stones by the contraction of the gall-bladder, and this gives rise to another important element. The lining of the gall-bladder is now no longer in contact with the relatively non-irritating bile, but also with these hard bodies, which are often of very irregular form, frequently having sharp angles or projections.

My clinical experience has convinced me that the above theory is correct, because in most of my cases there has been a distinct interference with the natural drainage of the gall-bladder. In many cases this was caused by a drawing down of the gall-bladder due to adhesions to the omentum or transverse colon or both, probably due to adhesions caused by a peritonitis resulting from a perforative appendicitis which the patient had sustained many years before.

In other cases there was a pedunculated gall-bladder which has been attributed to the effects of tight lacing, and, as in my cases this condition occurred only in women, it seems possible that this view is correct.

It has been found that bacteria, especially the colon bacillus, are present with great regularity in diseased gall-bladders and in gall-stones (Bloch, Terrier, Bouchard, and others). Cushing has found that 30 per cent. of the gall-stone patients operated at the Johns Hopkins Hospital had previously suffered from typhoid fever, and I have found that more than 35 per cent. of my cases suffered from acute or chronic appendicitis. In the record of this year's cases a little over 50 per cent. had suffered from appendicitis.

It is difficult to determine whether in these cases the infection of the gall-bladder and the intestine in typhoid fever and that of the gall-bladder and the appendix in appendicitis is simply a simultaneous infection, or whether the infection of the gall-bladder is secondary to the other infections.

In the experiments upon animals, it was shown that the simple infection of the gall-bladder gives rise to no pathological condition, provided there is no obstruction to the biliary or the cystic duct (Charcot, Gambault, Chiari, and others). The constant flow of new bile seems to be sufficient to dilute and wash away the infectious material to a sufficient extent to make the infection harmless.

It is quite different as soon as there is an obstruction to the ducts. As soon as there is residual bile in which the micro-organisms can multiply, a pathological condition will ensue which may simply develop into a catarrhal inflammation of the mucous lining of the gall-bladder, or it may result in the formation of gall-stones or in a severe inflammation of the gall-bladder involving the anatomical structures beyond the mucous membrane.

In man this obstruction may result from the inflammation of the mucous membrane of the common duct due to an infection from the alimentary canal, or, as I have seen in a number of cases, the gall-bladder may be drawn downward by adhesions, causing a short bend in the common or more usually in the cystic duct, or an adhesion between the stomach and duodenum and the liver or the gall-bladder may have the same effect. This condition is often due to a gastric ulcer. Again the gall-bladder may be forced down out of its normal position on account of tight lacing, and the mucus and *débris* accumulated in this pouch containing residual bile may be expelled at intervals, and may clog the cystic or the common duct, and may thus form the obstruction necessary to make the infectious material effective. I have repeatedly observed a complete obstruction of the common duct produced in this manner. I have observed some of the most violent paroxysms of gall-stone colic in cases of this kind.

If this obstruction persists in the presence of infectious material in the gall-bladder, a suppurative inflammation may ensue, and this may result in an empyema of the gall-bladder; or, if the infection is severe, especially if there be present spasmodic contraction of the gall-bladder, the entire mucous lining of the latter may become gangrenous, a condition which I have repeatedly observed in acute cases. This may in turn extend to the other layers of the gall-bladder, resulting in a gangrene of the entire organ, or this condition may affect only a small portion of the gall-bladder. When this is the case, the contraction of the non-affected portion of the gall-bladder is likely to cause a perforation at the gangrenous point.

It is of practical interest to know that these spasmodic contractions of the gall-bladder correspond with the contractions of the stomach, and that they will subside when the stomach is at rest, only to recur when this condition of rest in the stomach is interrupted.

I have repeatedly observed that attacks of gall-stone colic which would not subside from the use of as much as one-half to three-fourths of a grain of morphine given hypodermically, would stop directly upon irrigating the stomach with very hot water, and thus putting the stomach to rest, only to recur the moment any form of food was taken into the stomach, giving rise to the normal contraction of the latter organ. In these cases a renewed use of gastric lavage and further abstaining from food would result in permanent interruption of the spasmodic contraction of the gall-bladder. This point is of great practical importance, because it does not only indicate an efficient means for securing the relief of pain, but also for preventing further destruction of gall-bladder tissue and possible perforation. In case perforation should still occur, it would be much more likely that this should result into the alimentary canal if the stomach and bowels have been at rest.

In Case XLV the gall-bladder was adherent to the anterior abdominal wall an inch below the umbilicus. There was a perforation of the abdominal wall at this point half an inch in diameter, and this communicated with a hernial cavity un-

derneath the deep fascia one and one-half inches in diameter, which contained seven gall-stones and a quantity of pus and granulation tissue. I have seen two other similar cases and one gall-bladder which had perforated into the stomach, and others which had perforated into other portions of the alimentary canal have been described by other observers.

I have found a gall-stone in the ileum one and one-half inches in diameter, which must, of course, have entered this viscus by ulceration, as it was too large to pass through the cystic or the common duct. The operation was performed for the relief of acute intestinal obstruction, and the patient's condition was too serious to permit the necessary manipulations to locate the point of perforation, hence this could not be determined.

In order to give this paper practical value, I have had all the cases tabulated in which I have operated for disease of the gall-bladder at the Augustana Hospital, forty-eight in all, during the year 1901.

A study of this table shows a number of facts which are worth bearing in mind. The points to which I wish to direct attention especially refer (1) to the sex of the patients, there being thirty-seven women and eleven men in this table; (2) to the age, only one of the patients being less than thirty years of age at the time of admission, although a large number of these patients refer the beginning of their symptoms back to the age between twenty and thirty years. (3) I have noticed that a large proportion—thirty-seven out of forty-eight, in fact, nearly 80 per cent. of these patients—complained especially of digestive disturbances, and that almost all of them had been treated by a number of physicians for gastritis. (4) One-half the number of these patients have never suffered from distinct biliary colic, and of those who had suffered from these paroxysms one-half had been looked upon as suffering from gastralgia. (5) Only a small proportion of these cases have been severely jaundiced at any time, twelve cases, or 25 per cent., and in more than one-half of the number, twenty-five cases, no jaundice had ever been observed, hence the two

symptoms upon which so much stress has always been laid in the diagnosis of gall-stones have been absent in by far the greater number of these cases. The third classical sign, the passage of gall-stones in the fæces, was absent in all but a few of these cases. I believe, consequently, that it will be necessary to change the basis of our diagnosis entirely, because the old plan must continue to result in wrong diagnoses.

The symptoms which will most constantly lead to a correct diagnosis when gall-stones are present are not biliary colic, jaundice, and passing of gall-stones with the fæces, as we have been taught for many years, but (1) digestive disturbances, a feeling of weight or burning in the vicinity of the stomach after eating, gaseous distention of abdomen; (2) a dull pain extending to the right from the epigastric region around the right side about at a level with the tenth rib, extending to a point near the spine and progressing upward under the right shoulder-blade; (3) a point of tenderness upon pressure between the ninth costal cartilage on the right side and the umbilicus; (4) a history of having had one or more attacks of appendicitis or typhoid fever. (5) In many of these cases there is a slight tinge of yellow in the skin, not sufficient to be recognized as icterus, but still sufficient to be perceptible upon close inspection, especially on the days on which the patient is not feeling very well, when she complains of feeling bilious. (6) There is usually an increase in the area of liver dulness. (7) There may be a swelling of variable size opposite the end of the ninth rib.

Of course, if we have added to these symptoms the biliary colic, followed by distinct jaundice and possibly by the passage of biliary calculi, our diagnosis is still further confirmed; but even without these last three conditions we must make the diagnosis ordinarily, or we will miss a diagnosis in most patients suffering from gall-stones.

So long as the gall-stones simply remain in the gall-bladder without causing any complications, the harm to the patient is relatively slight. His comfort will be greatly interfered with on account of the disturbances in his digestion.

The pain will not be extreme, and he usually accumulates an abundance of fat, especially in the abdominal walls. It has consequently been held by many authorities that it is not wise to make use of radical measures for the removal of gall-stones so long as they do not give rise to any grave disturbances. This would undoubtedly be a proper and reasonable view to take were the danger to the patient approximately the same before and after the occurrence of these complications. This, however, is not the case, as is shown in this series, in which all of the cases which were operated before any serious complications occurred recovered, while the deaths occurred in cases which could undoubtedly have been saved had they been operated earlier before this occurrence.

Complications.—The complications which are likely to be caused by the presence of gall-stones may be chronic in character, taking the form of digestive disturbances and giving rise to almost constant discomfort. This condition is probably due to the interference with the passage of food through the pylorus into the duodenum, causing dilatation of the stomach.

Again, the patient may constantly be in a slightly septic condition, because there is absorption of septic material from the infected residual bile as well as from the products of fermentation in the dilated stomach. These conditions frequently result in chronic invalidism, making it impossible for the patient to follow the ordinary occupations and to enjoy life in any way. The constant irritation of the gall-bladder, due to the pressure of gall-stones, undoubtedly has much to do with the development of carcinoma in this organ.

In cases of primary carcinoma of the gall-bladder I have always been able to get a history of gall-stones dating back many years, and I have invariably found these present in the gall-bladder in these cases at the time of the operation or autopsy. Aside from these chronic conditions, gall-stones may at any time cause exceedingly grave acute conditions. These complications are all the result of inflammation, and their result must consequently depend upon the extent to which this develops. I take the following list of complications from

Mayo-Robson's excellent work on this subject because its arrangement is most satisfactory.

(1) Ileus due to atony of the bowel, leading to enormous distention, and to the symptoms and appearances of acute intestinal obstruction apparently the consequence of the violent pain.

(2) Acute intestinal obstruction dependent on

(a) Paralysis of gut due to local peritonitis in the neighborhood of the gall-bladder.

(b) Volvulus of small intestine.

(c) Stricture of intestine by adventitious bands originally produced as a result of gall-stones.

(d) Impaction of a large gall-stone in some part of the intestine after ulcerating its way from the bile channels into the bowel.

(3) General hæmorrhages, the result of long-continued jaundice, dependent either on gall-stones alone, or on cholelithiasis associated with malignant disease.

(4) Localized peritonitis producing adhesions, which may then become a source of pain even after the gall-stones have been gotten rid of. We believe that nearly every serious attack of biliary colic is accompanied by adhesive peritonitis, as experience shows that adhesions are found practically in all cases where there have been characteristic seizures.

(5) Dilatation of the stomach dependent on adhesions around the pylorus.

(6) Ulceration of the bile passages, establishing a fistula between them and the intestine.

(7) Stricture of the cystic or common duct.

(8) Abscess of the liver.

(9) Localized peritoneal abscess.

(10) Abscess in the abdominal wall.

(11) Fistula at the umbilicus, or elsewhere on the surface of the abdomen, discharging mucus, muco-pus, or bile.

(12) Empyema of the gall-bladder.

(13) Infective and suppurative cholangitis.

(14) Septicæmia or pyæmia.

(15) Phlegmonous cholecystitis.

(16) Gangrene of the gall-bladder.

(17) Perforative peritonitis due to ulceration through, or to rupture of, the gall-bladder or the ducts.

(18) Extravasation of bile into the general peritoneal cavity.

(19) Pyelitis on the right side due to a gall-stone ulcerating its way into, or an abscess of the gall-bladder bursting into, the pelvis of the kidney.

(20) Cancer of the gall-bladder or of the ducts.

(21) Subphrenic abscess.

(22) Empyema of the right pleura.

(23) Pneumonia of the lower lobe of the right lung.

(24) Chronic invalidism and inability to perform any of the ordinary business or social duties of life.

(25) Suppurative pancreatitis.

(26) Chronic interstitial pancreatitis.

(27) Infective endocarditis.

(28) Cirrhosis of liver.

Treatment.—In any case complicated with an acute inflammatory condition, I believe the same general principles should be employed in the treatment of this condition as in inflammatory conditions involving the peritoneum from any other cause. So long as there is no circumscribed accumulation of pus the treatment should consist in rest. This can be secured most readily by using gastric lavage in order to remove remnants of food or decomposing mucus from the stomach, then prohibiting the use of food and cathartics by mouth.

The use of moist heat in the form of poultices or fomentations or of cold by means of an ice-bag gives the patient great comfort, and is undoubtedly beneficial. Morphine may be given hypodermically if necessary, but so long as neither food nor cathartics are given by mouth the pain usually subsides rapidly and permanently. Nourishment may be given by enema not oftener than once in four hours, nor in larger quantities than four ounces at a time.

I prefer for this purpose one ounce of any one of the vari-

ous reliable predigested foods mixed with three ounces of warm normal salt solution. Unless the acute condition is complicated with a mechanical obstruction of the intestines, the patient's chances for recovery from the acute attack are always better without than with an immediate operation.

It is necessary to make a definite distinction between intestinal obstruction due to peritonitis and the same condition due to a mechanical condition such as the impaction of a gall-stone. The former condition is so much more common than the latter, that it is only very seldom that the latter need to be considered.

When the patient has recovered from the acute attack, his further treatment may be conducted medically, which will not cure him, but may improve his condition very greatly, or surgically, which is likely to result in a perfect and permanent recovery.

The medical treatment must consist chiefly in the use of large quantities of water preferably taken hot, and in the use of a diet fairly free from sugar and starch. I believe, however, that the greatest benefit comes from drinking a great amount of good water, never eating quite enough to satisfy the hunger, and from taking vigorous out-of-door exercise, such as horseback riding, walking, or rowing. Sodium phosphate in doses of one drachm taken in a large goblet of hot water half an hour before each meal and pure olive oil taken in doses of one-half to four ounces at bedtime in the foam of beer, ale or malt extract or in orange wine seem to have given relief to patients suffering from gall-stones, many of them remaining free from severe attacks for long periods of time by taking these remedies and diet and proper exercise.

Whether this relief is due to the fact that in this manner the alimentary canal is kept in a relatively aseptic condition, constipation is prevented and elimination facilitated by the use of large draughts of hot water, or whether there is a special virtue in the remedies, it is difficult to say. That many patients are relieved of their gall-stone colics upon following this plan of treatment there can be no doubt. It is plain, however, that

this form of treatment can be of benefit only to a limited number of patients, namely, those in which there is no impaction of the gall-stones in the gall-bladder or in the common or cystic duct, and which are not complicated with serious lesions of any portion of the mucous membrane lining these parts or with extensive adhesions.

Moreover, there are but few patients who are willing to follow any strict form of treatment long after they are apparently well, and consequently they are likely to have recurrences with one or more of the complications which have been enumerated. Aside from this there is always the danger of the occurrence of carcinoma as a result of the long continued irritation.

For all cases, then, which cannot be relieved in this manner with any degree of permanency, and for those who are unwilling to undergo continuous medical and hygienic treatment for the sake of securing relief from paroxysms without being relieved of their gall-stones, nothing remains but the removal of the gall-stones by an operation.

Operation.—In this, as in every intra-abdominal operation, it is wise to limit the manipulations as nearly as possible to the immediate vicinity of the part operated upon, namely, the gall-bladder and ducts, because the shock can in this manner be reduced to the smallest possible amount.

The incision should be made through the outer edge of the right rectus abdominis muscle about one and one-half to three inches in length, beginning one inch below the costal arch. If there are no adhesions and the gall-bladder is distended with bile, it will present in this incision as soon as the peritoneum has been opened, otherwise it may be hidden out of sight underneath the edge of the liver or in a mass of adhesions.

It is best always to explore the gall-bladder, the cystic duct, and the common duct by inserting the right hand into the foramen of Winslow and grasping these structures successively between the thumb above and the fingers below. If no gall-stones are found in the common duct, it is usually not neces-

sary to enlarge the incision unless the gall-bladder is greatly shrunk; but if there are stones in the common duct, it is best to make a free incision at once in order to be able to perform every step of the operation in plain view. Before going farther with the operation, it is well to bring up the cæcum and inspect the appendix. So large a proportion of gall-stone cases are complicated with chronic or recurrent appendicitis that it is best not to overlook this organ. If the appendix is not normal, it is removed in the ordinary way.

Then the entire cavity is carefully tamponed away with aseptic gauze moistened in warm, sterile, normal salt solution. This step is of great practical importance, because one can never be certain that the contents of the gall-bladder or duct are sterile. If the gall-bladder is distended with bile, it is well to insert a large cannula and to aspirate this fluid before opening the organ. It is well to lift up the edges of the gall-bladder as soon as it is opened by means of hæmostatic forceps, in order to prevent the spilling of any remnants of bile which may still be present. This can be removed by packing long strips of moist gauze into the gall-bladder and withdrawing them. If there are gall-stones in the gall-bladder these can usually be removed most conveniently with a blunt curette. If there are also gall-stones in the cystic duct these can frequently be forced back into the gall-bladder by gentle pressure from without. Occasionally, it is well to dilate this duct slightly by means of a pair of forceps or a uterine dilator.

In some cases it is possible even to push back the gall-stones from the common duct into the gall-bladder in the same manner, but this is not common. If this cannot be done, it is best to place one finger underneath the duct and then push the stone forward to make a longitudinal incision over the most prominent part of this object. This will be forced out through the opening as soon as it is large enough.

It is best to insert a rubber tube directly into this opening in the duct, and to prevent it from slipping by stitching it to the duct above and below with a catgut suture. Then a strand of iodoform gauze is stitched to the duct above and below the

incision, and a glass drainage tube wrapped with iodoform gauze is inserted into the pouch underneath the liver in order to drain this space, which is so likely to be infected.

The gall-bladder is now brought out of the upper angle of the wound and packed with iodoform gauze and sutured to the peritoneum. In case the gall-bladder is too short to be treated in this manner, it should be drained in the manner described above in connection with the common duct. If the gall-bladder is diseased beyond the possibility of recovery, it should be removed. In most of these cases it is still better simply to remove its mucous membrane by Mayo's method. Then the gauze pads which have protected the surrounding structures will be removed and the abdominal wound closed in the usual way.

The patient is given nothing by mouth for several days, in fact, until he is normal. The drainage tubes are removed about the fourth day. If there is no pain, the iodoform gauze tampon is left in the gall-bladder for the same period of time; if there is pain, it is removed sooner. If the lining of the gall-bladder has been severely inflamed, a drainage tube is inserted and kept in place for several days or weeks in order to secure free drainage; if it is not severely inflamed, it is permitted to heal spontaneously as soon as the gauze has been removed.

I will review the deaths which occurred in this series because they seem especially instructive.

The first death occurred in Case V, a woman fifty-seven years of age, who suffered from pyloric obstruction due to carcinoma. A gastro-enterostomy was performed, and a number of gall-stones, forming together a mass the size of a small hen's egg, were removed and the gall-bladder drained. The patient was entirely relieved of pain and distress, but did not regain her strength, and died six weeks after the operation from exhaustion. She was able to sit up two weeks after the operation, and obtained a considerable amount of relief as a result of the operation.

The next death occurred in Case X, a patient thirty-six years of age, who came to the hospital five days after the beginning of an extremely violent attack of gall-stone colic. The

patient was very obese, and had previously been strong and well. The attack had been characterized by great violence from the beginning, and her condition had gotten constantly worse. She suffered from intestinal obstruction evidently due to peritonitis. Her abdominal walls were extremely tense, but so fat that nothing could be determined by palpation or percussion. The pain had been in the entire abdomen, but more severe over the gall-bladder.

It seemed as though an immediate operation might result in relief. It was necessary to make a long incision through the fat in order to reach the gall-bladder on account of the great thickness of the abdominal wall. The intestines were severely congested, there being an acute peritonitis. The ascending colon was greatly distended with soft faecal matter. The gall-bladder contained a number of gall-stones and was distended with dark colored viscid bile; its mucous membrane was almost black. The gall-bladder was opened, the gall-stones removed, and the gall-bladder sutured to the transversalis fascia and drained. The extreme distention of the ascending colon caused me to make a puncture, introduce a tube and permit about two quarts of intestinal contents to drain away. Then the opening was closed with a double row of interrupted Lembert sutures placed transversely. The peritonitis progressed, the patient did not die until the third day, probably because of her great natural resistance.

In this case, I believe that our judgment was bad. It was clear at the operation that what could be done to benefit the patient could not compensate for the harm which must inevitably result from the traumatism accompanying the operation. In such cases I have fared better by securing by means of gastric lavage an exclusively rectal alimentation.

Cases XX and XLV died on the fifth and twelfth days after the operation from exhaustion. Both of these cases had suffered for a number of years, and had become weaker and weaker, notwithstanding every effort to build up their strength by means of medical and hygienic treatment. They were emaciated, neurotic, and anæmic. In both cases the operation was quite extensive. It is quite likely that it would have been better to simply drain these gall-bladders and remove the gall-stones which could be reached easily, and to have made a secondary operation after building up the patient.

In Case XLVII there was a carcinoma of the splenic flexure

of the colon obstructing the lumen of the intestine. An abscess had formed in the abdominal wall which had been opened, leaving a fistula, through which all the *fæces* were evacuated. In making an abdominal section for the purpose of making an intestinal anastomosis, we discovered the gall-bladder distended with a pint of bile and containing nine gall-stones, the size of a filbert, one of these being conical in shape, obstructing the cystic duct after the fashion of the ball-valve described by Professor Fenger. After making the anastomosis between the sigmoid flexure and the *cæcum* I performed a cholecystostomy. The patient had been severely ill for four months, and did not recover from the shock, but died on the third day after the operation.

Case XLVIII had a cholecystotomy performed for the removal of gall-stones four years ago. Since that time he had been in good health until two days before entering the hospital. While at work at hard labor, lifting a weight, he suddenly felt a pain in the region of the umbilicus, so severe that he fainted and had to be carried home. During the next week he became more and more jaundiced, had severe attacks of pain every day followed by a chill, suffered from nausea and vomiting and constipation. His abdomen was tense, and he had a bad facial expression. Under rest in bed and exclusive rectal alimentation he began to improve after the first week, his jaundice decreased somewhat, and after two weeks he was able to take liquid food. There still remained a considerable amount of pain in the region of the gall-bladder which was attributed to a stone in the common duct. I had planned to operate on December 18, but on that day his temperature rose to 103° F. and his pulse to 130 beats per minute, and the patient had a bad appearance. On the afternoon of the same day both temperature and pulse became normal, and remained so. It seemed likely that the condition was due to some indiscretion and amounted to nothing, consequently I decided to operate on December 20.

I found omentum, transverse colon, stomach, duodenum, liver, and a small stump of the gall-bladder three-fourths inches in diameter universally adherent, and the omentum also adherent to the abdominal wound, at the lower end of which there was a ventral hernia. The common duct was bent at an angle by the adhesions. The gall-bladder was separated from the bladder and opened and contained clear, viscid bile. A drainage tube was

inserted into the common duct and fastened by means of two sutures of catgut. The cavity underneath the liver and above the right kidney was drained by means of a posterior opening, as advised by Robson, and a glass tube covered with iodoform gauze was passed underneath the gall-bladder and out of the abdominal wound. The remaining portion of the abdominal wall was closed.

On the second day after the operation the patient had a return of a condition similar to that which he had on December 18, from which he never fully recovered. He died on the tenth day after the operation. A complete autopsy was not permitted. An examination of the field of operation showed that the end of the common duct had been covered with lymph and was closed. The field of operation had been walled off by adhesions and there was no peritonitis, but two inches from the pylorus there was a circular perforation of the duodenum one-fourth of an inch in diameter.

It is clear, now, that this patient should not have been operated upon so soon after the condition which developed on December 18.

In conclusion, I will say that these cases have served to strengthen my regard for the following conclusions:

(1) The diagnosis of disease of the gall-bladder and of gall-stones requires further study and observation.

(2) The classical symptoms must be supplemented in order to be sufficient as a basis for diagnosis.

(3) It is not wise to operate during the acute attack of cholecystitis.

(4) Patients much reduced by long-continued suffering do not bear well prolonged operations upon the gall-bladder and ducts.

(5) Robson's observation that patients with carcinoma of intra-abdominal organs do not bear gall-bladder operations well has been borne out by my experience.

(6) If the operation cannot be postponed in presence of extreme jaundice, it should be confined to simple drainage of the gall-bladder.

RÉSUMÉ OF

Number.	Hospital Number.	Age.	Sex.	Occupation.	Admission.	Discharge.	Duration of Disease.	Stomach Symptoms.	Colic.	Jaundice.	Complications.
1	8,546	34	F.	House-work.	Jan. 2	Feb. 13	Five years.	Bloating and eructation of gas.	Five attacks.	None.	Chronic appendicitis.
2	8,549	35	F.	House-work.	Jan. 3	Aug. 15	Seventeen years.	Pain in epigastrium after eating; frequent vomiting.	No severe attacks.	Slight attacks.	Chronic appendicitis.
3	8,670	52	F.	House-work.	Jan. 28	Mar. 15	Nine years.	None except persistent vomiting with attacks of colic.	Numerous attacks.	None.	Obliterative appendicitis.
4	8,717	50	F.	None.	Feb. 7	Mar. 14	Thirty years.	Frequent vomiting.	None.	None.	Chronic appendicitis.
5	8,773	57	F.	Badgemaker.	Feb. 20	April 5	One year.	Nausea and vomiting; abdominal distention; eructation of gas; pain.	None.	Quite marked.	Carcinoma of stomach.
6	8,794	36	F.	House-work.	Feb. 25	Mar. 26	Fourteen years.	Chronic gastritis for several years.	Numerous attacks.	None.	Empyema of gall-bladder; chronic appendicitis.
7	8,799	35	F.	House-work.	Feb. 26	Mar. 26	One year.	Chronic gastritis.	Numerous attacks.	None.	Chronic appendicitis; floating right kidney.
8	8,823	37	F.	House-work.	Mar. 3	Mar. 24	Twelve years.	None.	Two attacks.	None.	Chronic appendicitis.
9	8,843	49	M.	Machinist.	Mar. 7	Mar. 23	Ten days.	Pain in epigastrium and vomiting for one week.	None.	None.	Intestinal obstruction.
10	8,875	36	F.	House-work.	Mar. 13	Mar. 16	Five days.	.....	None.	None.	Intestinal obstruction.
11	8,906	30	F.	House-work.	Mar. 19	April 30	Five years.	Pain in epigastrium after eating; eructation of gas; chronic gastritis three years.	Numerous attacks.	None.	Hæmorrhoids.
12	8,994	40	M.	Chemist.	April 9	Mar. 9	Twelve years.	Pain in epigastrium after eating, lasting two to four hours; often regurgitated a mouth full of bitter fluid.	None.	Slightly a few times.	Chronic appendicitis.
13	9,053	50	F.	House-work.	April 23	May 23	Twenty-three years.	Troubled with sick headaches; pain in epigastrium half an hour after eating.	Two attacks.	Never jaundiced until four weeks ago.	Chronic appendicitis.

CASES.

Contents of Gall-bladder.	Diagnosis.	Treatment.	Remarks.	Result.
Twelve stones; thick dark bile.	Gall-stones; chronic appendicitis.	Laparotomy; removed twelve gall-stones; drained gall-bladder; removed appendix.	Appendix adherent behind cæcum, constricted by adhesion; mesenteric glands about appendix enlarged.	Recovery.
Thick dark bile.	Cholecystitis.	Laparotomy; drained gall-bladder; removed appendix.	Gall-bladder long and pendulous; appendix adherent at end, last one inch of lumen obliterated, middle third filled with faecal concretions.	Recovery
Sixty gall-stones.	Gall-stones.	Laparotomy; removed gall-stones and drained gall-bladder; excised remainder of appendix.	Appendix almost obliterated; just a band of connective tissue remained.	Recovery.
Dark thick fluid containing sand.	Cholecystitis; chronic appendicitis.	Laparotomy; drained gall-bladder; excised appendix.	History indefinite and contradictory; appendix large, adherent.	Recovery.
Impacted with gall-stones.	Gall-stones and carcinoma of stomach.	Laparotomy; gastro-enterotomy with Murphy button; removed gall-stones and drained gall-bladder.	Vomiting stopped after operation, but patient was never able to be about; died from exhaustion.	Died six weeks after operation.
Purulent fluid; many small gall-stones varying from size of pea to filbert.	Gall-stones; empyema of gall-bladder; chronic appendicitis.	Laparotomy; gastro-enterotomy; removed gall-stones and drained gall-bladder; excised appendix.	Appendix doubled on itself by adhesions; distinct history of severe appendicitis three years ago.	.....
Thick dark bile with sand.	Cholecystitis; floating kidney; chronic appendicitis.	Laparotomy; drained gall-bladder; anchored kidney to parietal peritoneum; excised appendix.	.....	Recovery.
Thick dark bile with sand.	Cholecystitis; chronic appendicitis.	Laparotomy; drained gall-bladder; excised appendix.	Appendix universally adherent.	Recovery.
Impacted with gall-stones.	Gall-stones; intestinal obstruction; diffuse fat necrosis.	Laparotomy; removed gall-stones and drained gall-bladder.	Found gall-bladder severely inflamed and filled with impacted gall-stones; pancreas swollen and inflamed; diffuse fat necrosis in omentum; patient improved slightly after operation, but died on fifteenth day after operation from intestinal hæmorrhage.	.....
Distended with gall-stones.	Gall-stones; intestinal obstruction; diffuse peritonitis.	Laparotomy; removed gall-stones and drained gall-bladder; punctured colon and removed large amount of faecal matter.	Patient entered hospital in extremely bad condition, which was steadily getting worse; it is likely that she would have been more likely to recover had she been treated with gastric lavage and exclusive rectal feeding.	Died three days after operation from peritonitis.
A fibrous mass at entrance of common duct into duodenum.	Biliary obstruction.	Laparotomy; duodenum incised longitudinally, small fibrous mass removed; wound in duodenum closed transversely; lining membrane of gall-bladder dissected out, ligated near cystic duct; wound drained.	Two years ago patient had appendix removed; one year ago had one large gall-stone removed.	Recovery.
Dark bile; whole lining of gall-bladder felt granular.	Cholecystitis; chronic appendicitis; chronic pancreatitis.	Laparotomy; drained gall-bladder; excised appendix.	Appendix club-shaped; constriction near cæcal end; head of pancreas enlarged; lymphatics along common duct enlarged.	Recovery.
Five large gall-stones.	Gall-stones; chronic appendicitis.	Laparotomy; removed five gall-stones; drained gall-bladder; excised appendix.	Appendix sausage-shaped and contained five faecal concretions size of a hazel-nut.	Recovery.

RÉSUMÉ OF

Number.	Hospital Number.	Age.	Sex.	Occupation.	Admission.	Discharge.	Duration of Disease.	Stomach Symptoms.	Colic.	Jaundice.	Complications.
14	9,058	41	F.	House-work.	April 23	May 23	Two years.	Symptoms of chronic gastritis.	None.	None.	.....
15	9,146	43	F.	House-work.	May 16	June 26	One year.	Almost constant burning pain in epigastrium.	None.	None.	Obliterative appendicitis.
16	9,188	23	M.	Farmer.	May 25	July 2	Two years.	Constant sour stomach; vomited frequently; colicky pains after eating.	None.	None.	Chronic appendicitis.
17	9,214	60	F.	House-work.	May 30	July 7	Ten years.	Capricious appetite; craved sour articles.	Numerous attacks.	Several times.	Empyema of gall-bladder; obliterative appendicitis.
18	9,269	45	F.	Physician.	June 11	Oct. 2	One year.	Solid food caused discomfort all through abdomen, and nausea; frequent vomiting.	Never severe.	None.	Chronic appendicitis.
19	9,289	50	M.	Banker.	June 16	July 18	Seven years.	None.	Six attacks.	Marked.	None.
20	9,308	51	F.	House-work.	June 20	June 29	One year.	Indigestion; pain in epigastrium one hour after eating; gradually growing worse.	Two attacks.	None.	Empyema of gall-bladder.
21	9,316	34	F.	House-work.	June 22	Aug. 25	Eleven years.	Often nauseated.	Numerous attacks.	None.	Chronic appendicitis; salpingitis.
22	9,330	38	F.	House-work.	June 26	Aug. 9	Two years.	Discomfort after eating; feeling of fullness; abdominal distention; eructation of gas; regurgitation of sour fluid.	None.	None.	Chlorosis.
23	9,373	52	F.	House-work.	July 6	July 28	One week.	Four severe attacks of pain in epigastrium past week.	No real gall-stone colics.	Slightly.	None.
24	9,521	59	M.	Tailor.	Aug. 8	Oct. 27	Three years.	Almost constant pain in epigastrium.	Several slight attacks, none severe.	None.	Pancreatitis.
25	9,530	40	F.	House-work.	Aug. 11	Sept. 22	Seven years.	Distention of abdomen; eructation of gas after eating; appetite poor.	Seven attacks.	None.	Extensive adhesions.
26	9,551	55	F.	House-work.	Aug. 4	Oct. 29	Two years.	Eructation of gas; pain in epigastrium after eating; often nauseated.	One slight attack seven weeks ago.	Marked.	None.

CASES.—*Continued.*

Contents of Gall-bladder.	Diagnosis.	Treatment.	Remarks.	Result.
Dark bile with sand.	Cholecystitis.	Laparotomy; drained gall-bladder.	Mesentery full of nodules; carcinoma? tuberculosis?	Recovery.
Thick dark bile.	Cholecystitis; obliterative appendicitis.	Laparotomy; drained gall-bladder; excised remnant of appendix.	.....	Recovery.
Dark tarry bile.	Cholecystitis; chronic appendicitis.	Laparotomy; drained gall-bladder; excised appendix.	Appendix contained six faecal concretions.	Recovery.
Purulent fluid; gall-stones.	Gall-stones; empyema of gall-bladder; obliterative appendicitis.	Laparotomy; removed five gall-stones; drained gall-bladder; excised remnant of appendix.	.....	Recovery.
Mucous; solitary gall-stone size of pigeon egg.	Gall-stones; chronic appendicitis.	Laparotomy; removed gall-stone; drained gall-bladder; excised appendix.	.....	Recovery.
Thick dark bile; one gall-stone size of English walnut.	Gall-stones.	Laparotomy; removed gall-stone; drained gall-bladder.	The wall of the gall-bladder was greatly thickened and closely applied to surface of gall-stone.	Recovery.
Pus and impacted gall-stones.	Gall-stones; empyema of gall-bladder.	Laparotomy; removed great many stones from gall-bladder; eight stones from common duct; three from cystic duct.	Gall-bladder was adherent to stomach, and was so contracted that could not sew to peritoneum; patient was greatly weakened; her temperature remained normal, but she died of exhaustion five days after operation.	Died five days after operation from exhaustion.
Four gall-stones; thick tarry bile.	Gall-stones; chronic appendicitis; salpingitis.	Laparotomy; removed four gall-stones and several small fragments; excised appendix; excised both Fallopian tubes.	Appendix adherent, almost obliterated; both tubes adherent, congested, and closed at ends.	Recovery.
Thick dark bile with sand.	Cholecystitis; cholangitis.	Laparotomy; drained gall-bladder; excised appendix.	Patient gained in weight and color while recovering from operation.	Recovery.
Greatly distended with thick dark bile.	Cholecystitis.	Laparotomy; drained gall-bladder; excised appendix incidentally.	.....	Recovery.
Thick dark bile; sand; several small gall-stones.	Gall-stones; pancreatitis.	Laparotomy; removed gall-stones; drained gall-bladder.	Gall-bladder was considerably distended; pancreas enlarged.	Recovery.
Solitary gall-stone size of pigeon egg.	Gall-stones.	Laparotomy; removed gall-stone and pus; drained gall-bladder.	Liver, stomach, pancreas, and intestines all a mass of adhesions; no attempt to loosen adhesions; made incision directly through lower end of right lobe of liver and opened into gall-bladder, which was adherent on under surface; glass drain placed through liver into gall-bladder; peritoneum protected by placing iodoform gauze pads between liver and peritoneum.	Recovery.
Distended with thick dark bile, containing sand; one gall-stone size of English walnut.	Gall-stones.	Laparotomy; removed gall-stone; drained gall-bladder.	Had several severe hæmorrhages from gall-bladder during three weeks following operation; controlled by tamponing with gauze saturated with 1000 adrenalin solution.	Recovery.

RÉSUMÉ OF

Number.	Hospital Number.	Age.	Sex.	Occupation.	Admission.	Discharge.	Duration of Disease.	Stomach Symptoms	Colic.	Jaundice.	Complications.
27	9,267	21	F.	House-work.	June 11	July 21	Three years.	None.	Numerous attacks.	Severely jaundiced four months ago.	Recurrent appendicitis.
28	9,348	50	F.	Dress-maker.	June 30	Aug. 21	Four months.	None.	Five attacks.	With each attack.	Recurrent appendicitis.
29	9,572	57	F.	House-work.	Aug. 20	Sept. 1	Ten years.	Subject to attacks of vomiting; constipation; pain in epigastrium past eight months.	None severe.	Slightly.	Carcinoma of liver.
30	9,649	36	F.	House-work.	Sept. 3	Aug. 14	Nine years.	Greatly troubled with eructations of gas; pain after eating; always vomits after heavy meal.	Numerous attacks.	Many times.	Chronic appendicitis; cyst of left ovary.
31	9,668	24	M.	Office.	Sept. 8	Oct. 12	Eleven years.	None.	Numerous attacks.	Slight many times.	Recurrent appendicitis.
32	9,694	42	F.	House-work.	Sept. 12	Oct. 27	Three years.	Sense of fullness after eating; constipation.	Numerous attacks.	Slightly once.	Empyema of gall-bladder.
33	9,707	40	F.	House-work.	Sept. 16	Nov. 13	Seven years.	Almost constant pain, relieved somewhat by presence of food.	None.	None.	Fibroid of uterus; cysts of both ovaries.
34	9,758	30	M.	Laborer.	Sept. 29	Oct. 28	Seven months.	Eructation of gas; heaviness in stomach after eating.	None.	Very marked.	Acute appendicitis.
35	9,788	40	F.	House-work.	Oct. 3	Nov. 18	Four years.	None.	Thirteen severe attacks.	Marked.	None.
36	9,811	48	F.	House-work.	Oct. 8	.....	Several years.	Chronic gastritis.	None.	None.	Movable kidney.
37	9,819	57	F.	House-work.	Oct. 10	Nov. 10	Four years.	None.	About twenty attacks.	Slightly once.	None.
38	9,846	42	M.	Minister.	Oct. 19	Nov. 18	Two years.	None.	Eight attacks.	Slightly twice.	Chronic appendicitis.
39	9,859	38	F.	House-work.	Oct. 21	Nov. 18	Twenty-nine years.	Eructation of gas; constipation; pain in epigastrium.	Numerous attacks.	Many times.	Pyloric obstruction; empyema of gall-bladder; chronic appendicitis.

CASES.—*Continued.*

Contents of Gall-bladder.	Diagnosis.	Treatment.	Remarks.	Result.
Distended with bile.	Recurrent appendicitis; adhesion of gall-bladder.	Laparotomy; excised appendix; drained gall-bladder.	Appendix adherent, curled upon itself; gall-bladder greatly distended with bile, pendulous.	Recovery.
Adherent and greatly distended with bile.	Recurrent appendicitis with acute cholecystitis.	Laparotomy; excision of appendix.	Appendix thick, congested, adherent, had been perforated one inch from distal end; did not disturb gall-bladder on account of weakened condition of patient.	Recovery.
Impacted with gall-stones.	Gall-stones; carcinoma of liver.	Exploratory; laparotomy.	Found gall-bladder impacted with gall-stones; liver enlarged and covered with carcinomatous nodules; recovered from operation but was not benefited.	Recovery.
Small stricture one-half inch from distal end; one gall-stone.	Gall-stones; chronic appendicitis; ovarian cyst.	Laparotomy; removed gall-stone; drained gall-bladder; excised appendix and left ovary and tube.	Distal half of appendix cicatricial; omentum adherent to gall-bladder; the left ovary contained a cyst the size of an orange.	Recovery.
Small, contracted; one stone in common duct.	Gall-stones; recurrent appendicitis.	Laparotomy; removed gall-stone from common duct.	Appendix adherent and curled upon itself; unable to bring gall-bladder up to peritoneum, so sutured iodoform gauze pads to posterior surface of gall-bladder and brought out through wound.	Recovery.
Greatly distended with pus and gall-stones.	Gall-stones; empyema of gall-bladder.	Laparotomy; removed gall-stone; drained gall-bladder.	Gall-bladder large as a fist.	Recovery.
Two gall-stones size of hickory nuts.	Gall-stones; fibroid of uterus; ovarian cysts.	Laparotomy; removed gall-stones; drained gall-bladder; abdominal hysterectomy; removed both ovaries and tubes; removed appendix incidentally.	.....	Recovery.
Greatly distended and inflamed.	Acute appendicitis with cholecystitis.	Laparotomy; excision of appendix.	Appendix in shape of question mark, severely congested; gall-bladder greatly distended with bile, not disturbed on account of bad condition of patient; will probably require cholecystotomy at some future time.	Recovery.
Nine gall-stones.	Gall-stones; cholecystitis.	Laparotomy; removed gall-stones; drained gall-bladder.	.....	Recovery.
Greatly distended with bile.	Cholecystitis; movable kidney.	Anchored kidney; laparotomy; drained gall-bladder.	Gall-bladder adherent to stomach and greatly distended with bile; obstruction to common duct due to adhesions.	Recovery.
Contained one thousand three hundred and thirty gall-stones; size millet seed as large as pea.	Gall-stones.	Laparotomy; removed gall-stones; drained gall-bladder.	.....	Recovery.
Small and shrunken, lined with granulation tissue.	Cholecystitis; chronic appendicitis.	Laparotomy; drained gall-bladder; excised appendix.	Appendix contained fecal concretions; constriction near middle.	Recovery.
Pus; several gall-stones.	Gall-stones; empyema of gall-bladder; pyloric obstruction; chronic appendicitis.	Laparotomy; removed gall-stones; drained gall-bladder; gastro-enterostomy; excised appendix.	Appendix long, congested, constricted; gall-bladder, liver, stomach, and intestines all adherent.	Recovery.

RÉSUMÉ OF

Number.	Hospital Number.	Age.	Sex.	Occupation.	Admission.	Discharge.	Duration of Disease.	Stomach Symptoms.	Colic.	Jaundice.	Complications.
40	9,866	50	F.	House-work.	Oct. 22	.....	Several years.	Distress after eating and eructation of gas.	None.	Slightly.	Renal calculus; pyosalpinx; appendicitis; epithelioma of cheek.
41	9,872	31	F.	House-work.	Oct. 24	.....	Six months.	Eructation of gas; bloating after eating.	None.	None.	Chronic appendicitis.
42	9,892	39	F.	House-work.	Oct. 29	.....	Ten years.	Eructation of gas; often nausea.	None.	None.	Chronic appendicitis.
43	9,896	33	F.	House-work.	Oct. 29	.....	Three years.	Considerable distress in epigastrium; more marked after eating.	None severe.	None.	Cyst of both ovaries.
44	9,926	53	F.	House-work.	Nov. 6	.....	Two months.	Food is repugnant; very constipated.	None.	None.	Chronic appendicitis; uterine polypus.
45	10,020	64	F.	None.	Dec. 1	.....	One month.	Constipated; appetite irregular.	None.	None.	Left femoral hernia; empyema of gall-bladder; abscess in abdominal wall.
46	10,035	49	M.	Tailor.	Dec. 3	.....	Three years.	Distress in epigastrium after eating heavy meal.	Three mild attacks.	None.	Cæcum adherent to anterior parietal peritoneum.
47	9,915	63	M.	None.	Nov. 4	Dec. 1	Several years.	Nausea; distress after eating; eructation of gas; occasional vomiting.	None.	None.	Carcinoma of splenic flexure of colon, with perforation and abscess.
48	10,012	31	M.	Laborer.	Nov. 28	Dec. 29	Three weeks.	Suffered frequently from nausea and from indigestion.	Almost constant severe attacks.	Marked.	.....

CASES.—*Concluded.*

Contents of Gall-bladder.	Diagnosis.	Treatment.	Remarks.	Result.
Seventeen gall-stones.	Pyonephrosis; gall-stones; chronic appendicitis; epithelioma of cheek.	Laparotomy; removed gall-stones; excised appendix; excised epithelioma; removed right kidney.	Appendix adherent posteriorly, contained faecal concretions; constricted; pelvis of right kidney contained irregular stone one and a half inches long.	Recovery.
Black bile with sand.	Cholecystitis; chronic appendicitis.	Laparotomy; emptied gall-bladder; dissected out mucous membrane of gall-bladder, ligated and drained; excised appendix.	There was a valve-like constriction of gall-bladder near opening of cystic duct; appendix adherent, bent, constricted, and full of faecal concretions.	Recovery.
Thick black bile; five large stones.	Gall-stones; chronic appendicitis; salpingitis; hypertrophied uterus.	Laparotomy; removed gall-stones; drained gall-bladder; abdominal hysterectomy; excised both ovaries and tubes; excised appendix.	Appendix full of faecal concretions; a hamatosalpinx on right side.	Recovery.
One gall-stone.	Gall-stones; ovarian cysts.	Laparotomy; removed gall-stone; drained gall-bladder; left ovary and tube excised; right ovary resected; ovarian cyst the size of hen's egg.	.....	Recovery.
Distended with thick tarry bile.	Cholecystitis; chronic appendicitis; uterine polypus.	Laparotomy; drained gall-bladder; excised appendix; removed uterine polypus.	Appendix had two concretions, one a half inch from distal end, the other half an inch from that; appendix completely occluded between these points.	Recovery.
Pus; fifty gall-stones.	Gall-stones; empyema of gall-bladder; perforation of gall-bladder into abdominal wall.	Laparotomy; removed gall-stones and drained gall-bladder; incised abscess in abdominal wall and removed seventeen gall-stones from same.	Gall-bladder had perforated into abdominal wall in median line two inches below umbilicus; there were seventeen gall-stones in the abdominal wall at that point.	Died twelve days after operation from exhaustion; normal temperature, but never gained any strength after operation.
Twenty-nine gall-stones; some pus.	Gall-stones; peritoneal adhesions.	Laparotomy; excision of gall-stones; drained gall-bladder; loosened adhesions.	Patient had appendix removed two years ago, but symptoms still persisted.	Recovery.
Eighteen gall-stones and greatly distended with bile.	Gall-stones; carcinoma of colon with perforation and abscess.	Incision and drainage of abscess; eighteen days later made an anastomosis between sigmoid and ascending colon; removed gall-stones and drained gall-bladder.	.....	Died; shock
Very small; contained clear bile.	Adhesions and cicatricial stenosis of common duct.	Laparotomy; separated adhesions; excised gall-bladder; dilated stricture of common duct; placed rubber tube in common duct and sutured in place for drainage; drained space underneath liver posteriorly.	Had laparotomy and several gall-stones removed in 1897; perfectly well until two days before admission to hospital.	Died; perforation of duodenum on the tenth day.

ANALYSIS OF THREE HUNDRED AND TWENTY-EIGHT OPERATIONS UPON THE GALL-BLADDER AND BILE PASSAGES.¹

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FROM June 24, 1891, to February 28, 1902, 328 cases of gall-stone or other disease involving the gall-bladder and biliary passages have been operated upon by myself or my brother, Dr. C. H. Mayo, at St. Mary's Hospital, Rochester, Minn. This includes all the cases of this description which have been admitted to the hospital during this period. A study of these cases brings out some general features of interest. Three hundred and eleven of the number were of benign origin and the number of deaths was eight, giving a mortality of about $2\frac{1}{2}$ per cent. Seventeen were for malignant disease with three deaths, a mortality of nearly 18 per cent.

Location of the Stones.—In 214 cases the stones were located in the gall-bladder or cystic duct or both, with two deaths. In about 10 per cent. of these cases there was obstruction of the cystic duct by a stone, or stones were contained in the cystic duct, in either case requiring considerable effort to dislodge them. The after history of many of these cases in which the cystic duct was involved and simply cholecystostomy performed was not wholly favorable. While the hospital records do not show the condition excepting of those readmitted for secondary operation, the number of these cases, with others not reoperated but known to the writer as having had unpleasant symptoms subsequent to the operation, leads to the

¹ Read before the Chicago Surgical Society, March 5, 1902.

belief that for cases in which the cystic duct has been obstructed or in which stones have been lodged in the duct for a length of time cholecystostomy is insufficient, and that the gall-bladder should be extirpated at the primary operation if the patient is otherwise in good condition. A large percentage of cases in which the cystic duct has been involved leads to such a disturbance of its mechanism either by stricture, valve formation, or other unfavorable condition, that it may not furnish adequate drainage to the gall-bladder. In some extreme cases, the gall-bladder becomes filled with mucus, which is only expelled through the duct by such vigorous contractions as to cause an occasional colic, or a mucous fistula is left with intermittent external discharge. In other cases at the secondary operation, the gall-bladder is found filled with bile and mucus, developing a condition in which exit to the cystic contents is less easy than entrance of bile. In many the discomfort is slight and passes away in time, but there is a large number of cases in which this interference with drainage is sufficient to give symptoms more or less permanent in character. The nature of the difficulty can be aptly compared to stricture of the lachrymal duct or urethra. Nearly one-half of the cholecystectomies performed were secondary to this condition, and only after extirpation did a permanent cure result.

Stones in the cystic duct are often more easy to remove with the gall-bladder than without it. If the peritoneum, binding it to the liver, be divided on each side, the connective tissue between can be easily separated with the finger, and by using the gall-bladder as a tractor, and, if necessary, dividing the peritoneal and muscular coats just above the cystic duct, the mucous tube of the latter will strip out readily, bringing the stone with it. The mucous coat about the neck of the gall-bladder is thick and separates easily from the outer coats, while the fixation by adhesions is to the outer coats alone. At the fundus the mucous membrane is less easy to separate, and a combination of amputation of the fundus with removal of the mucous coat from the lower portion of the gall-bladder and cystic duct makes cholecystectomy a safe operation. The

drains should be tied to the stump with fine catgut to prevent displacement, and a strip of rubber tissue placed between the drains and the stomach to prevent adhesions. The catgut fixation sutures are absorbed before it is necessary to remove the drains. In most cases the whole gall-bladder can be so easily removed as to render this stripping of the mucous membrane unnecessary, but in primary stone impactions and secondary operations for stricture it serves a good purpose; and, as it leaves a pouch composed of the outer coats into which a tube drain can be securely fastened, the cystic duct can be left open for drainage of the hepatic ducts in cases in which an infective cholangitis is present. Ligature of the cystic duct would prevent this imperative indication (Davis). To leave the cystic duct open in the abdomen for this purpose without direct and complete drainage would be attended with more danger. The bile itself would drain safely to the surface with ordinary care in placing the drains, but not so the infected material from the ducts. If there is no infection of the hepatic and common ducts,—and usually there is none,—drainage of the bile to the surface is unnecessary, and the cystic duct can be closed by ligature. Out of thirty-three cholecystectomies we had but one death, and this was due to ligature of the cystic duct in a case in which the hepatic ducts should have been drained through it.

Cholecystectomy will rapidly gain in favor and will undoubtedly supersede cholecystotomy in a large group of cases.

Stones Outside the Bile Tract. Thirteen cases, no deaths. —In thirteen cases, stones were found outside of the gall-bladder and biliary ducts. In some the calculi were encapsulated in the adjacent liver border, forming hard nodules from which, upon incision, they could be enucleated. In others a mass about the fundus would contain a number of stones, with perhaps a little mucopurulent fluid. Further dissection towards the cystic duct would open a functioning organ of small size, with every evidence that it was but the remains of the gall-bladder.

In several cases we have seen this in the process of evolu-

tion, opening a pocket composed of the remains of the fundus, but slightly separated by ulceration and connective-tissue formation from the neck of the organ. The gall-bladder perforated, the extruded stones in a mass of adhesions communicating freely with the fundus or perhaps several such pockets lined with granulation tissue and more or less separated from each other.

In other cases, the stones were found lying in a pocket outside the gall-bladder with adhesions to the intestine, but communicating with neither. The fundus contracted to a mass of scar tissue. In three cases we found stones outside the gall-bladder without communication with it, but with a fistulous opening into the intestine, twice to the duodenum and once to the transverse colon. Removal of the stone in these cases made it necessary to close the fistulous tract connected with the bowel.

In the two cases in which the duodenum was involved, the friable nature of the infected tissues and the deep seat of the area to be sutured made this a matter of considerable difficulty, and one case formed an intestinal fistula which was very troublesome, but later healed. In both of these cases there were stones in the gall-bladder, but the cystic duct was totally obstructed. It is probable that in both cases the stones had been impacted in the cystic duct before the ulceration took place. A study of these cases leads to the belief that stones passing by ulceration and perforation from the gall-bladder and cystic duct to the intestine do so slowly, and that often, if not usually, cicatrization takes place behind before the extrusion into the intestine is accomplished. The next most common direction for stones to travel is towards the surface of the body. The gall-bladder becomes obstructed at the cystic duct and its contents infected. Adhesions form to the parietal peritoneum, and eventually by ulceration work to the surface as a subcutaneous abscess. This was met with twice in this series of cases, and one case was admitted with a fistulous opening following spontaneous rupture. In a considerable experience in the operative treatment of gall-stone disease in

private houses and local hospitals, we have found this latter condition relatively more frequent than in St. Mary's, as the local peritonitis which marks these cases prevents their transportation, while extensive changes attending the extrusion of the stones into the intestine may give little symptomatic evidence of trouble.

Cholecystitis.—In this group were thirty-four cases with five deaths. This mortality calls attention at once to the serious nature of the infections. All the cases in which an acute suppurative condition existed at the time of the operation, with or without stones, and all cases in which the gall-bladder was found thickened and contained more or less ropy mucus and bile or sandlike sediment, without stones, were classified at the time of operation as cholecystitis. It would seem that the difference was so marked between these two conditions as to render a double classification necessary, and that the first should be called suppurative and the second catarrhal cholecystitis. It was noted in the group that might be termed catarrhal that cholangitis was more frequently an accompaniment, although usually of a mild and irregular type; and that after the operation, as there was no obstruction by stone or otherwise at the cystic duct, an extension of the inflammatory process manifested itself in these three cases and death resulted. In the suppurative form the gall-bladder was comparable to a closed cavity containing pus, and so thoroughly blocked at the cystic duct as to prevent progressive infection. In all but four of the acute empyemas, the stone was removed at the primary operation. In three cases the gall-bladder was also shelled out. Two cases of acute empyema, in which the stone was removed after great difficulty, developed a fatal suppurative cholangitis after cholecystostomy. One of these cases also had a profound jaundice with purpura hæmorrhagica, and death was probably as much, or more, from the hæmorrhage as from the progressive infection. The stone in this case was impacted at the juncture between the common and cystic ducts, obstructing both. The other case was typical,—the removal of the impacted stone allowed the septic material

to penetrate the ducts. In the four cases in which the gall-bladder was drained, and on account of the serious condition of the patient, no attempt was made to remove the obstruction, each one recovered promptly, and the stone was removed at a secondary operation with the gall-bladder.

Cholecystitis with or without obstruction at the cystic duct is the most dangerous condition for which we are called upon to operate, and although the patient may be apparently in good condition, progressive infection of the ducts is liable to supervene. In acute infections little manipulation should be made and quick drainage established; and if a stone obstructs the cystic duct, it is safer to leave it for a second operation, or, as we have done of late, remove the entire gall-bladder to a healthy point proximal to the stone. With the exception of these four cases, all the stones have been removed at the primary operation or were discharged through the fistula later in some of the earlier cases. In no cases was there a reformation of stone so far as known. Gall-bladders which have become cystic from stone obstructing the cystic duct, and in which, after the clear mucus is drawn off, some purulent looking fluid comes up, having the physical appearance of pus, are not included in this group. These cases are common, and are classed with the ordinary obstructions at the cystic duct in which the stone should be removed at the primary operation.

The author has long held the view that the dependent fundus is an important mechanical factor, in that it favors stone formation in cases in which stagnation of the bile, infection of the gall-bladder, and some interference with drainage through the cystic duct are the other factors: that is to say, if the cystic duct were at the bottom, the sediment would pass out first. For this reason, it seems that cholecystitis might be more liable to exist without stones in the cases in which the fundus was above the level of the cystic duct. It is possible that the permanent elevation of the fundus, produced by the adhesion to the abdominal incision, may be one cause of the non-formation of new stones after cholecystostomy.

In two cases acute suppurative cholecystitis followed

typhoid fever, in each instance developing suddenly,—one case during the third week and the other during the fifth week after the beginning of the fever. At the time of operation the typhoid bacillus was found in pure culture and the patient's blood gave the Widal reaction. In both cases stones were present in the gall-bladder, but, on going into the history, it could be shown almost beyond a doubt that the gall-stones existed before the advent of the typhoid, and merely determined a lowered resistance. In taking the histories of the cases of gall-stones operated upon at the hospital, only a very small percentage had had typhoid fever at any time. It would seem that the etiological importance of typhoid fever in the causation of gall-stones had been overestimated.

Cholecystostomy has been made by introducing into the gall-bladder a rubber tube, the size of a lead-pencil, wrapped in gauze, then covered with rubber tissue. A catgut, purse-string suture is then placed below the incision in the fundus and the ragged edge of the opening in the gall-bladder inverted into its cavity (Summers). The suture is then pulled taut, compressing the packing about the tube and making a tight joint; the drain is held in place by a catgut suture. If the gall-bladder is too short to reach to the parietal peritoneum for fixation, a few strips of gauze are tacked to it with catgut, and form an extension to the surface. In a considerable number of cases the drains have been carried out through a stab wound and the operative incision completely closed. In the course of other operations, if gall-stones coexist, a stab wound properly placed enables the fundus of the gall-bladder to be drawn out of the opening, and the stones can be removed and drainage established by the aid of the hand inside of the abdomen. Unless it is necessary to remove the gall-bladder, it is not wise to break up adhesions beyond a point necessary to explore the ducts and manipulate the fundus. Time spent in separating adhesions unnecessarily, which must reform, not only prolongs the operation, but breaks down a valuable barrier to the extension of the inflammatory process and opens up new avenues for infection.

Stones in the Common Duct. Thirty-one cases, one death.—In thirty-one cases stones were found in the common duct, and in only one case was it possible to remove the stone through the cystic duct by dilating it. This was a lucky accident, as I am convinced, from frequent failures, that attempts of this kind are a loss of time. In twenty-nine cases the duct was incised and the stones removed. In five cases this was accomplished by separating the gall-bladder from the liver and incising the free surface down to and along the cystic duct to the common duct, and the latter was incised at the juncture.

In two of these five cases the cystic duct tore completely loose from the common duct, leaving an irregular opening, which was closed by a plastic operation upon the duct, using the gall-bladder denuded of the mucous membrane, excepting at one point, at which enough was left to fill the gap. The remainder of the outer coats of the gall-bladder was trimmed to a convenient sized flap and wrapped about the common duct, and held by a few catgut sutures and a light gauze pack. The biliary leakage was very slight in either case and lasted but a few days.

The large majority of cases of stones in the common duct were movable, and in two-thirds of the cases more than one stone was present in the duct (in one case twenty-seven stones). The typical ball-valve stone of Fenger was met with seven times. The rule was that where more than one stone was present the duct was sufficiently dilated to enable the introduction of the finger for purposes of exploration. In no other way could we be sure that we had removed them all. In five cases stones were also present in the hepatic ducts, but were movable, and were with varying difficulty brought to the incision in the common duct for removal.

In two cases energetic attempts to remove all the stones from the lower end of the duct or a diverticulum from it resulted in forcing the finger well into the duodenum, probably at an ulcerated point rather than at the site of the papilla.

Fitz has shown that large stones, as a rule, pass into the bowel by ulceration rather than by dilating the papilla. In these two cases the contents of the duodenum escaped from the drainage tubes for a number of days, causing rapid emaciation. One recovered completely, the second left the hospital after seven weeks in bad condition, and eventually died at her home from inanition. This was the only death in this group.

In a number of these cases the head of the pancreas was enlarged, and in six cases more or less pancreatic secretion came out with the bile, excoriating the skin, and causing a peculiar odor to the discharge which seems to characterize it. All of the cases recovered; one of these cases had a general acute eczema involving the entire body.

Jaundice.—Jaundice in connection with stones in the common duct was a most variable feature. In many cases it was so slight as not to attract especial attention, and the finding of stones in the common duct was a surprise. In the majority the jaundice was marked. Courvoisier long ago called attention to the fact that jaundice from stone in the common duct was accompanied by a contracted gall-bladder which could not be palpated externally in 80 per cent. of the cases. This was true of all but three of our cases. In these three the gall-bladder was filled with stones, preventing the usual contraction.

Jaundice as a Cause of Postoperative Hæmorrhage.—In three cases capillary oozing was a most serious postoperative complication. One case was in a precarious condition for twelve days from this cause. Robson has called attention to the value of chloride of calcium as a prophylactic in these cases. We have used this for about one year. I am uncertain as to its value, but we have had no deaths from hæmorrhage since. One case of empyema of the gall-bladder, complicated with extreme jaundice from a stone impacted in the cystic duct at its juncture with the common duct, and three cases of jaundice from malignant disease died from postoperative capillary oozing. In all of these cases there were subcutaneous ecchymotic spots, looking like purpura hæmorrhagica before opera-

tion. Every case of jaundice with this condition in which an operation upon the gall-bladder was made died in this way. No case in which this was not present died from this cause, although several were in extreme jeopardy. Tests as to the coagulability of the blood have been rather uncertain, but this clinical means of differentiating the operable from the non-operable cases has been impressed upon our minds.

After removing stones from the common duct, the incision has been closed by a continuous catgut suture, providing that the duct is in good condition, and no fragments of stone or other detritus are left behind; otherwise the duct has been partly closed, leaving a gap for drainage. If the patient was in bad condition, drainage was employed without suture. The suturing has been done with a single row, and, if there was much difficulty in doing this, only enough of a running suture was placed to direct the coaptation, drainage being provided for by fastening gauze wicks covered with rubber tissue in position with the catgut suture, to prevent displacement. In twenty-six cases cholecystostomy was made for drainage. In two cases cholecystectomy was performed, the cystic duct being left open for drainage. In one case the duodenum was incised to remove a stone from the ampulla of Vater.

Cholecystenterostomy was performed three times for chronic pancreatitis and three times for malignant disease. The anastomosis was made to the duodenum twice and to the transverse colon four times. So far as we could judge, the anastomosis with the colon answered every purpose. One benign case lived six years in good health and died from other causes, and a second is alive and well now, two years after the operation. While the duodenum is the proper place for the anastomotic opening, it sometimes happens that by reason of adhesions this site cannot be secured. The transverse colon is close at hand, and with its appendices—epiploica and omentum—furnishes a secure situation for the opening, and the operation itself may in this way be easily accomplished. There are many theoretical objections to it, and a loop of jejunum would seem a more desirable point for the entrance of the bile; how-

ever, the fact remains, that in most of the reported cases of anastomosis between the gall-bladder and colon the results have been good. The Murphy button was used in making the anastomosis.

In twelve cases an exploration showed an error in diagnosis. This, however, includes only the cases in which the abdominal wall was incised independently for this purpose, and does not fairly represent the mistakes. In some of the earlier cases a small gall-bladder, with thickened walls extensively adherent, was found, and we contented ourselves with loosening the adhesions. Recovery followed the operation in each instance, and the symptoms were usually relieved. In a few cases, however, there was no abatement of the previous pain. In reoperating upon one case, a ball-valve stone of small size was found in the common duct; yet so little jaundice was present as to seemingly preclude the possibility of its presence in this locality. In two cases since that we have found a rolling stone in the common duct under precisely similar circumstances. Adhesions about a small gall-bladder should lead to a careful exploration of the common duct before deciding that the adhesions alone are the cause of the symptoms. In the cases in which the gall-bladder was explored negatively, the real difficulty was usually an old appendicitis or ulcer of the stomach. In one case a stone in the right ureter, and once a small ovarian dermoid with a long twisted pedicle, was found to be the source of trouble.

The abdominal incision for work upon the biliary tract we have found most useful has been the straight one through the rectus muscle, enlarged, if necessary, either at the top or bottom after the method of Bevan, with the modification suggested by Robert Weir, incising the sheath of the rectus muscle and the deeper muscles obliquely and retracting the rectus itself rather than severing it.

Great difficulty in exposing the gall-bladder, especially if small and under the liver, may be experienced. By dividing the peritoneum binding the gall-bladder to the liver and separating the cellular space between, the parts can usually be

mobilized without dividing the rib cartilages. The venous hæmorrhage is quite free for a short time, but stops after temporary gauze packing, and in our cases has never been a serious source of trouble.

Of the eight deaths in the benign cases, four were due to progressive infection of the liver ducts with late kidney complications, one from the same cause with capillary hæmorrhage, and one sudden death due to myocarditis, which was recognized previous to operation, but the danger of which was not fully appreciated. Two cases died suddenly on the fourth day. The symptoms after the operation consisted of a peculiar nervous unrest, pulse 110 to 120, temperature 100° to 102° F., gastro-intestinal disturbance not marked, but some tympanitic distention shortly before death, which took place unexpectedly. The post-mortem did not show adequate cause for the result. The condition seems to correspond with that described as hepataurgia (Eisendrath), and due to cessation of liver action. The two cases belong to the group of cholecystitis without stones. In not a single case was peritonitis a cause of death.

Malignant disease involving the bile tract was found seventeen times; the results were very discouraging, with a single exception; the palliation secured was of doubtful character, and death followed immediately in nearly 18 per cent. of the cases.

The deaths were due to capillary hæmorrhage, and all of these cases had hæmorrhagica purpura. Stones were also present in all of the malignant cases in which the gall-bladder and ducts were explored.

RÉSUMÉ.

Operations for Non-Malignant Disease of the Gall-Bladder and Bile Passages occurring in St. Mary's Hospital of Rochester, Minnesota, from June 24, 1901, to February 20, 1902.

	No. Operated. Recov. Died.		
Cholecystostomy. Stones in gall-bladder, cystic duct, or both.....	199	197	2
Cholecystostomy. Polypus in gall-bladder..	1	1	
Cholecystostomy. Gall-bladder stone with acute pancreatitis and fat necrosis.....	1	1	

	No. Operated. Recov. Died.		
Cholecystostomy. Cholecystitis with and without stones.....	26	22	4
Choledochotomy. Stones in common duct..	30	30 ¹	
Cholecystectomy. Gall-stone disease.....	24	24	
Cholecystectomy. Cholecystitis.	8	7	1
Cholecystectomy. Cyst of gall-bladder containing ten quarts, supposed to be ovarian	1	1	
Cholecystenterostomy. Chronic pancreatitis and jaundice twice with gall-stones, once without	3	3	
Division of adhesions	5	5	
Duodenocholedochotomy. Stone ampulla of Vater	1	1	
Exploratory. Negative	12	12	
	<hr/> 311	<hr/> 304	<hr/> 7

Operations for Malignant Disease.

Cholecystostomy. Obstruction of common duct	4	2	2
Cholecystectomy and partial hepatectomy. Cancer of gall-bladder.....	1	1	
Duodenocholedochotomy. Cancer ampulla of Vater	1	1	
Cholecystenterostomy. Malignant obstruction of common duct.....	3	2	1
Exploratory. Inoperable cancer.....	8	8	
	<hr/> 17	<hr/> 14	<hr/> 3

¹ One case died after leaving the hospital two months after the operation.

THE SURGICAL ASPECTS OF THE STATUS LYMPHATICUS.¹

BY JOSEPH A. BLAKE, M.D.,

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FOR a number of years cases of sudden death from enlargement of the thymus gland have been reported. The majority of these have occurred during or in immediate connection with the administration of an anæsthetic, usually chloroform.

In recent years the more careful investigation of these cases has demonstrated other lesions, notably a hyperplasia of the lymphatic tissues throughout the body, often including the lymphoid marrow. Associated with the lymphoid hyperplasia there is enlargement of the spleen and often hypoplasia of the heart and aorta, and not infrequently rhachitis. Furthermore, in many of the earlier reported cases of thymus death, enlargement of the lymph nodes was noted, although not emphasized.

In a number of cases in which the exitus has resembled thymus death, the enlargement of the thymus has not been material, but the other lesions have been manifest. Thus it has come about that the deaths are considered to be due to a general lymphatic dyscrasia and not simply to the enlargement of the thymus itself; and consequently the name *status lymphaticus* or *constitutio lymphatica* has been given to the condition, which the majority of pathologists consider to be a distinct disease.

Hence the earlier theories which ascribed the deaths to a mechanical interference of the enlarged thymus with the functions of the trachea or the large vessels and nerves in the upper

¹ Read before the New York Surgical Society, January, 1902.

thorax have given way to the belief that death is due to a general lowering of the vital forces, as evidenced by a marked tendency to cardiac and respiratory failure. There are, however, cases on record that tend to show that an enlarged thymus by mechanical action alone may produce dyspnœa.

Two of these cases are especially interesting from their surgical aspects, and a brief *résumé* may not be out of place.

One reported by König was a child nine weeks old, which since it was eight days old had suffered from severe attacks of dyspnœa. The thymus was made out to be enlarged, extending to the cricoid in the neck. By means of a transverse incision it was exposed, the cervical portion excised, and the thoracic portion drawn up and anchored by sutures to the fascia over the manubrium. The operation was completely successful in relieving the dyspnœa, and healing was uneventful.

The second case, reported by Siegel, was a boy of two and a half years, who had been tracheotomized for a sudden attack of dyspnœa. The insertion of an ordinary cannula did not afford relief, and it was not until a tube had been inserted nearly to the tracheal bifurcation that the dyspnœa ceased. A diagnosis of enlarged thymus was made, and the thymus was drawn up and sutured to the fascia over the sternum. Recovery was uneventful, with no recurrence of the dyspnœa.

Although these cases may be confirmatory of a condition known as thymic asthma, which in itself uncommonly produces death, they cannot be said to have a true bearing upon the question of the production of sudden death by the thymus alone.

Lange, who cites several cases in support of the theory of compression of the trachea, reports one case in which the thymus pressed upon the trachea so that it was compressed from left to right and from behind forward, so that one diameter was only a third of the other. There was no softening of the tracheal cartilages. The child was found dead in bed. Autopsy showed evidences of asphyxia and general lymphatic enlargement. In this case the pressure of the thymus un-

doubtedly was a factor in producing death; but it is the exception to find distortion of the trachea from pressure.

Aside from pressure, it is difficult to say whether or not the hyperplasia of the thymus in the status lymphaticus is a factor in the production of death.

Many observers, however, incline to the theory that from the enlargement and increased activity of the thymus a condition of hyperthymization ensues, which is responsible for the unstable equilibrium of the vital forces.

Others accept the theory of Paltauf that the hyperplasia of the thymus is physiologically as well as anatomically an element of a general lymphatic hyperplasia, and is a result of a derangement of nutrition or metabolism which also causes a degeneration of the cardiac centres.

In many ways the thymus question resembles that of the thyroid in Graves's disease, namely, as to whether it is a cause or an effect. The interest of this comparison is still further heightened by the fact that status lymphaticus is not uncommonly associated with Graves's disease or simple struma.

The discussion of these theories is a most fascinating subject, but endless.

It seems well proven, however, by a long series of cases carefully studied by competent observers, that the condition known as the status lymphaticus is a pathological entity, and is characterized clinically by a lowered vitality or an unstable equilibrium of the vital forces, so that accidents or disturbances, otherwise unimportant, such as some slight injury or anæsthesia, may precipitate failure of the heart and respiration.

The following cases observed at the Roosevelt Hospital and the Sloane Maternity Hospital in the last year and a half illustrate well the clinical and pathological features of the disease.

CASE I.—Male, aged twenty-seven years; gripman; Ireland; admitted to the Roosevelt Hospital, December 7, 1901. Family history negative. Previous history, dyspepsia during last

five years. Present history, swelling thyroid, nine months; exophthalmos, five months; nervousness, palpitation, headache, progressive in severity. No dysphagia or dyspnoea; has lost twenty-six pounds.

Physical Examination.—Fairly developed, muscles soft. Very excitable and restless; tremor of hands and tongue. Marked exophthalmos. Heart action 136 to 170, tumultuous, irregular in force and rhythm, slightly enlarged to left, no murmurs. Lungs, liver, and spleen negative. Superficial lymph nodes moderately enlarged. Right lobe thyroid, nine by six centimetres; left lobe, six by six centimeters. Urine negative. Temperature, 99.2° F.; pulse, 136; respiration, 28. Under exhibition of digitalis heart became much steadier, the beats running about 130.

Operation, December 13, J. A. Blake. Nitrous oxide, ether anæsthesia, ninety minutes. Pulse at the beginning of operation, 140. Hemithyroidectomy. Removal of right lobe and part of isthmus. Although the growth was vascular, hæmorrhage was slight, all vessels being divided between ligatures. The gland was adherent to trachea, but was handled gently. The anæsthetic was well borne throughout the operation until the end, when the color became bad; the pulse ran up to 160 to 170; the respirations became shallow, the pupils dilated, and, in raising the head to apply the dressing, the heart and breathing suddenly stopped. Stimulation and artificial respiration were ineffectual. Near the end of the operation one-fiftieth grain atropine was given.

Autopsy, seven hours after death. Well built, well nourished man; rigor mortis of both extremities; post-mortem lividity of dependent parts. Pupils widely dilated and equal. No subcutaneous œdema. Axillary inguinal lymph nodes palpable. An operation wound in the midneck for removal of right half of goitre. The main lesions in this case were confined to the thyroid gland, thymus, and lymphatic apparatus of the body generally. The liver and kidneys merely showed cloudy swelling and the lungs were congested and œdematous. The left ventricle was hypertrophied. The heart was rather small; the aorta about normal. The thymus was excessively enlarged, measuring sixteen by eleven by one and a half centimetres. It covered the precordia almost entirely, and extended on the left side as low as the fourth rib, and to the third intercostal space on the right side. The weight was 135 grammes. The remaining left lobe of the

thyroid measured eight and a half by six by three and a half centimetres. The right lobe entirely absent as well as a part of the isthmus. The recurrent laryngeal nerve was not involved on either side, nor was there any evidence of compression of the windpipe by either the thyroid or thymus. The cervical, axillary, retroperitoneal, mesenteric, and inguinal lymph nodes were markedly swollen, and on section were of a light pink color and homogeneous structure. The largest in the mesentery measured three centimetres in length. Those in the axilla measured from one to two centimetres. The retroperitoneal nodes were somewhat smaller. The solitary follicles and Peyer's patches in the ileum were excessively swollen and presented no evidence of ulceration. The lymphatic structure of the stomach was prominent. Spleen swollen, Malpighian bodies very prominent. The bacteriological examinations were negative. The brain was not removed.

To summarize, the main lesion was excessive hyperplasia of the lymphatic apparatus of the body, most prominent in the mesentery, small intestine, spleen, and axilla. The thymus was excessively hypertrophied.

CASE II.—Male, aged two and a half years; American; admitted to the Roosevelt Hospital, December 3, 1900. Family and previous history negative. Well nourished, healthy appearing boy. Pulse, 96 to 132. Diagnosis, phymosis.

Operation, December 5, 1900, Dr. Turnure, House Surgeon. Anæsthetic, chloroform; twenty-five minutes. Circumcision. Condition good during and immediately after operation. Vomited once. Slight restlessness during night. Pulse became weaker in early morning (132). During the morning pulse became still weaker, extremities became cold. He developed drowsiness and finally coma, loss of radial pulse, and death about noon, twenty-three hours after operation. Highest temperature, 101.4° F. Stimulation, one-two-hundredth grain strychnine every three hours.

Autopsy made three hours after death. A well built boy. Pupils mid-wide and equal. No well marked post-mortem rigidity. The axillary and inguinal lymph nodes were palpable. The viscera, with the exception of the lymphatic apparatus of the body, were normal. The thymus measured eight and a half by five and a half by two centimetres. Weight, fifty-three grammes.

No signs of compression of the windpipe. The cervical, axillary, retroperitoneal, mesenteric, and inguinal lymph nodes were hyperplastic, the largest measuring about two centimetres. Peyer's patches and solitary follicles and Malpighian bodies of spleen excessively swollen. Cultures from the viscera remained sterile.

CASE III.—Female, aged thirty-two years; married; negro. Admitted to the Roosevelt Hospital, August 3, 1901. Family history negative. Previous history, rheumatism three years ago; no children, no miscarriages. Present history, for three months menorrhagia. Fairly nourished. Temperature 99.6° F.; pulse, 100; respiration, 24. Urine negative. Diagnosis, fibromyoma uteri.

Operation, August 9, 1901, Dr. Taylor. Nitrous oxide, ether, forty minutes. Supravaginal hysterectomy. During latter part of operation breathing became shallow, pulse rapid and feeble, and suddenly stopped. Patient could not be revived by artificial respiration and stimulation.

Autopsy.—This was a well built, moderately well nourished woman. No subcutaneous œdema, moderately and equally dilated pupils. There was slight healed tuberculosis of the right apex with slight chronic diffuse nephritis and left ventricle hypertrophy. The thymus reached down to the third rib and measured seven and a half by five by two and a half centimetres. Weight, forty-six grammes. The spleen, axillary, cervical, mesenteric, and retroperitoneal lymph nodes moderately swollen; the largest of latter measuring about one and a half centimetres. The Peyer's patches and solitary follicles markedly hyperplastic. Cultures from this case were uniformly negative.

CASE IV.—I am indebted to Dr. A. J. Lartigau for the history as well as the findings of the autopsy in this case. Male, fifty-five years; United States. Previous history negative. Well nourished, apparently healthy man. Operation in private house (name of operator not given) for vicious union of fracture of leg. In early part of anæsthesia, before the commencement of the operation, sudden death from heart failure.

Autopsy.—Well built, well nourished adult. The only lesions found, outside of a slight cirrhosis of the liver and kidney, were marked enlargement of the thymus, which measured six by five by two and a half centimetres. Weight, twenty-two grammes. Slight hyperplasia of retroperitoneal, mesenteric, cervical, axil-

lary, and inguinal lymph nodes. The Peyer's patches and solitary follicles were also moderately hyperplastic. The autopsy was made five and a half hours after death, and the cultures taken from the different viscera remained sterile.

The remaining are not cases of anæsthesia.

CASE V.—Male, forty years; married; negro; United States. Admitted to the medical ward of the Roosevelt Hospital, July 2, 1901. Family history, brother died of tuberculosis. Previous history, alcohol, moderate; syphilis, twenty-five years; smallpox, eighteen years ago; acute rheumatism, twenty-five years ago. Subject to quinsy. Present history, three months ago sudden loss of voice; no pain, cough, or dyspnœa. Two weeks ago sudden attack of dyspnœa with unconsciousness. Dyspnœa has persisted with pain in side. Temperature, 100.6° F.; pulse, 140; respirations, 36.

Physical Examination.—Heart, apex in fifth space, four inches from median line. Action regular, good force, no murmurs. Dulness over manubrium sterni extending towards left. Lungs, moderate changes in both apices. Harsh breathing over lower part of lungs. Liver and spleen negative.

Cyanotic, respirations labored with paroxysms of severe dyspnœa. Dyspnœa increasing, tracheotomy was done by the House Surgeon without affording relief, and the wound was closed. Patient improved slowly and was discharged on August 14. Returned on August 17 with marked dyspnœa, loss of voice, pain in chest, and slight dyspnœa. Death in two days, with irregular pulse and dyspnœa.

Autopsy.—This was a well built, well nourished adult negro with an old tracheotomy scar in the mid-neck. Right pupil was markedly dilated, left mid-wide. Thymus was enlarged, measuring eight by seven by three centimetres. Weight, forty-nine and a half grammes. No signs of compression of the windpipe. There was well-marked aneurism of the thoracic aorta, with erosion of the subjacent vertebræ, but without any evidences of rupture or pressure on windpipe. The cervical, mesenteric, retroperitoneal, and axillary lymph nodes markedly swollen; the largest measuring two by two and a half centimetres. Peyer's patches and solitary follicles were moderately swollen. Spleen,

moderately swollen and congested. The bacteriological examination failed to reveal the presence of any micro-organism in the tissues.

CASE VI.—Male, aged thirty years; janitor; negro; United States. Previous history, except for alcoholism, not obtained. On December 22, 1901, while having his boots blacked, had a sudden attack of syncope. On arrival of ambulance a few minutes later, he was found with a very weak rapid pulse, shallow respirations, and marked pallor. On arrival at hospital his condition was unchanged, and on lifting him on to the stretcher he suddenly died.

Autopsy ten hours after death. This was a well built, well nourished man. Pupils contracted and equal. No œdema. The superficial lymph nodes were palpable. The main lesion in this case was one of chronic diffuse nephritis, hypertrophy of the heart, and mitral and aortic valve disease. Aorta normal in size. The thymus, mesenteric, and retroperitoneal lymph nodes markedly enlarged, also the Peyer's patches and some of the solitary follicles. Spleen swollen. Malpighian bodies hyperplastic. Thymus measured seven by five by one and a half centimetres. Weight, thirty-five grammes.

CASE VII.—Female, aged thirty years. Family and previous history negative. Death, twenty-two hours after normal labor, at the Sloan Maternity Hospital.

Autopsy.—No lesions were found in this case outside of the lymphatic apparatus. The thymus measured nine by five by one and a half centimetres. Weight, thirty-two grammes. The axillary, cervical, mesenteric, retroperitoneal, and inguinal glands moderately swollen. Peyer's patches and solitary follicles were also moderately hyperplastic. The autopsy was made five and a half hours after death, and the cultures taken from the different viscera remained sterile.

Microscopical Examination. Dr. A. J. Lartigau.—“The microscopical examination of the different tissues from these cases, on the whole, confirmed the gross anatomical findings. The lymphoid tissues in addition to the simple hyperplasia presented certain lesions described by Oertel in diphtheria and by others in other infections. Oertel's lesions, which presumably consist chiefly of localized endothelial hyperplasia, were especially to be observed in all these cases with the exception of

Case V, being especially noticeable in Peyer's patches, Malpighian bodies of the spleen, and less frequently in the superficial lymph nodes. The occurrence of such lesions is rather suggestive of the toxic nature of the condition associated with status lymphaticus; possibly hypersecretion by the thymus gland or perverse metabolism resulting in the formation of toxic substances. It is well known that the injection of toxic products into animals gives rise to just such hyperplasia of the lymphatic apparatus and the formation of these so-called Oertel's lesions. This being the case, it does not seem to be a great step to the assumption that sudden death in these cases of status lymphaticus is probably due to some form of toxæmia; certainly, none of the cases could be explained by any mechanical factor, such as compression or infection. This was expressly looked for in these cases. No lesions were found which in themselves could account for the deaths. The lymphoid hyperplasia is to be regarded as the resultant of some influence, but not as the primary lesion in this condition."

REMARKS.—Five of these seven cases died in one hospital in a period only a little longer than a year. The occurrence of so many cases in so short a time in one hospital is undoubtedly unusual; yet it is a forceful reminder that we should be on the lookout for this condition, and it was largely for this reason that I determined to present this subject.

It is rather striking that three of these seven cases should be negroes. I am unable to find any observations on the racial occurrence of status lymphaticus. Too little investigation has been done in this country to determine this point as regards the negro. The association of status lymphaticus with rachitis and the latter's frequency in the negro are suggestive in this connection. One of six cases of status lymphaticus, of which I have notes through the courtesy of Dr. David Bovaird, was a negro with marked evidences of rachitis.

Age.—Of my seven cases all were adults with one exception. This is interesting, as the disease is usually considered one of early life; most cases having been observed in the first decade.

Compression of Trachea.—In none of Dr. Bovaird's or my cases were there any evidences at autopsy of tracheal com-

pression by the enlarged thymus. In only one of the adult cases were there attacks of dyspnœa. Two of Dr. Bovaird's had attacks resembling laryngismus stridulus.

Size of the Thymus.—In the adult cases the thymus varied in weight from twenty-two to 135 grammes, and in the children from ten to fifty-three grammes.

Dr. Bovaird (personal communication) has made 100 observations on the normal size of the thymus in children, and finds it much smaller than usually stated. According to him, it averages not over three grammes in weight.

The largest thymus occurred in Case I. This case had exophthalmic goitre, and consequently the mechanical effects of the thymus cannot be so well estimated. The patient, however, exhibited no subjective symptoms that could not be explained by his Graves's disease, and certainly none of direct pressure by the thymus, although it is one of the largest, if not the largest, thymus on record.

This case is of especial interest on account of the association of exophthalmic goitre and status lymphaticus. Hypertrophy of the thymus has been frequently observed in exophthalmic goitre.

Allbutt makes a general statement that it is the rule. In twenty-six cases, collected from the literature, of operative death in exophthalmic goitre, in which a general anæsthetic was used, in eight cases hypertrophy of the thymus was mentioned (Debove, Tilmann, Siegel, Hämig, v. Bardeleben quoted by Gurlt, Schultz, Witmer, and Heussler), and in two cases (Kundrat and Higgins) status lymphaticus was given as the cause of death.

As to how often status lymphaticus coexists with exophthalmic goitre it is impossible to say; yet it is probable that in a number of the above cases in which the hypertrophy of the thymus was alone mentioned hyperplasia of the lymphatic tissues was overlooked; and it may not be too strong an assertion to make that status lymphaticus is in all probability accountable for more than credited of the sudden operative deaths in Graves's disease.

As having further bearing on the correlation of the thyroid with status lymphaticus, it is interesting to note that several deaths have occurred from status lymphaticus in thyroidectomies for simple goitre. Kundrat and Gluck have reported cases. And, further, the thyroid has been found enlarged in a large percentage of cases of status lymphaticus.

It seems to the writer that it is safe to conclude from these facts that any evidences of the status lymphaticus in patients having any variety of goitre should raise serious doubts as to the propriety of operative interference.

Anæsthesia in Status Lymphaticus.—The exhibition of an anæsthetic in patients suffering with status lymphaticus is at least frequently fatal. It is impossible to state how many of these patients pass through an anæsthesia without accident. It is known, however, that they may pass through one or two anæsthesias and succumb to the second or third. Chloroform is generally considered to be the most dangerous anæsthetic in these cases. The reason for this belief lies in the fact that chloroform is responsible for most of the reported deaths. If we consider that nearly all the deaths from status lymphaticus have been reported from Germany and Austria, where chloroform is employed almost to the exclusion of ether, we may question whether its danger as compared with ether is not exaggerated. Very few deaths from status lymphaticus in connection with anæsthesia have been reported in this country. I have only been able to find one in addition to my four. This one, reported by Ewing, was from chloroform, which would make two chloroform to three ether deaths. The number, however, is too small to draw conclusions.

There is, however, other evidence to prove that chloroform is the most dangerous, in that in the first decade, when status lymphaticus is most common, the proportion of chloroform to ether deaths is greater than for any other decade.

On the other hand, status lymphaticus has been held by some to be responsible for most of the chloroform deaths. Kundrat reports ten chloroform deaths in all of which status lymphaticus was present, and reviews eight others, reported

by others, in which it was also present. Kolisko, in a personal communication to Brickner, states that in about six cases of chloroform death, yearly coming under his observation, status lymphaticus was present in nearly all.

Manner of Death from Anæsthesia in Status Lymphaticus.—Death may occur at any stage of the anæsthesia, or even after some hours have elapsed, as is well shown by the cases reported in this article. The premonitory symptoms may be absent or extend over a considerable period. They are those of cardiac and respiratory failure, and consist of pallor, dilatation of the pupils, weakening of the pulse, and shallow respirations. The most rational treatment would seem to be direct stimulation of the heart by massage, heat, or electricity, and the injection of cardiac stimulants. The anæsthetic should be at once stopped.

Diagnosis of Status Lymphaticus.—The most practical knowledge of status lymphaticus would be a way of diagnosing it. Unfortunately, a definite diagnosis before death seems an impossibility; yet a careful physical examination may elicit signs which, especially if grouped, should lead to suspicion. Of chief diagnostic importance are evidences of lymphatic hyperplasia.

The tongue, nasopharynx, and fauces should be examined as well as the superficial lymph nodes. Sometimes the mesenteric glands may be palpable, as in a case of Ewing's. The spleen is usually only slightly enlarged.

The examination of the blood is said to be negative, although Ewing found a well-marked lymphocytosis in one of his cases. The antecedent history of the cases as throwing light upon the diagnosis is usually negative. In children, attacks of laryngismus stridulus or dyspnœa should be noted. In adults, attacks of syncope would seem to be the only subjective symptom.

The proof of the existence of hypoplasia of the aorta is well-nigh impossible. Ewing, however, mentions some signs which might denote its presence, such as absence of aortic pulsation in the neck, narrowness of the peripheral arteries, and

defective development of some of the organs, especially the sexual apparatus.

The occurrence of conditions known to be not infrequently associated with status lymphaticus, such as rhachitis or enlargement of the thyroid, would be still further proof of its presence.

It is hoped that further light will be shed on this subject by careful study and report of cases, and that, as a result, some of us may be spared the mortification of having a sudden death from this condition.

In conclusion, I wish to express my thanks to Dr. A. J. Lartigau for the careful summary of the post-mortem examinations, and also to Dr. David Bovaird for the histories and notes on the autopsies of six cases of status lymphaticus in children.

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ABSCESSSES IN THE RIGHT ILIAC REGION, AND
OTHER LESIONS NOT OF GYNÆCOLOGIC
OR APPENDICEAL ORIGIN MISTAKEN FOR
APPENDICITIS.¹

WITH REPORTS OF ONE HUNDRED AND NINETY-FOUR CASES,
WITH LESIONS OF TWENTY VARIETIES OF STRUCTURE AND
SIXTY-EIGHT SPECIES OF LESION, NOT ONE OF THE NUM-
BERED CASES OF APPENDICEAL ORIGIN AND ALL SO MIS-
TAKEN; SEVEN CASES HITHERTO UNREPORTED.

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IN reporting, in 1899, some "Iliac Abscesses Non-Spinal in Origin," the President of the Philadelphia Academy of Surgery, Dr. De Forest Willard, said, "At the present day it is well to remember that an individual may have pain and inflammation even in the right iliac region without having appendicitis, and that a woman may have a pelvic abscess which is not due to tubal disease." The present inquiry could not have a better introduction.

Beside the danger of overlooking gynæcologic and appendiceal inflammation and abscess,—a danger now ably exploited,—there is also a less heralded diagnostic peril, namely, that of mistaking as gynæcologic or appendiceal

¹ Annual Oration read before the Philadelphia Academy of Surgery, January 3, 1902.

the many other varieties of abscess occasionally met in the iliac fossa, and it is to this topic of diagnosis that this paper is devoted.

The comparative infrequency with which abscesses within the scope of this paper sufficiently resemble those stated to be outside of it, as to make differential diagnosis difficult, makes all the greater the probability of failures in discrimination, when this resemblance does occur, because its multiform possibilities of error are not kept in mind.

In verification of the liability to this mistake and towards its prevention, by placing its instances in view, attention will be invited: First, to an enumeration of the tissues in the right iliac fossa and its neighborhood that may become inflamed or abscessed themselves, or that may serve as reservoirs or as media of conduction for the pain or the pus of other tissues primarily inflamed, though, possibly, distant. Secondly, to the illustration of the misleading symptomatic resemblances existing between these lesions. This illustration will be supplied by abstracts from cases published in the past four years; by brief histories of five cases hitherto unreported that have been most kindly contributed to this inquiry by other observers; and by notes of two cases that came under the speaker's care and in one of which he was at fault.

ANATOMY OF THE ILIAC FOSSA.

The iliac fossa has as its skeletal foundation the internal surface of the iliac portion of the innominate bone. This surface is bounded above by the iliac crest and below by the iliopectineal line. The ilium articulates posteriorly with the sacrum, a small portion of the base of which is continuous with the concave surface of the iliac fossa. Externally and below, the ilium contributes to the formation of the acetabulum and articulates with the head of the femur. Like other bones, the ilium is covered with periosteum, and cartilage and ligament contribute to the formation of its joints. The iliac fossa is chiefly covered by the iliac muscle which arises from it, and it is partly covered at its internal portion by the psoas magnus. Both the psoas

muscles, the great and the small, arise from the bodies of the vertebræ, and the anterior surfaces of these muscles are in relation with the kidney and ureter. The *psoas parvus* is inserted in the pectoneal eminence of the iliac bone, but the *psoas magnus* is inserted in the lesser trochanter of the femur, and in its transit thither is in relation with the capsular ligament of the hip-joint. These three muscles are covered by the iliac fascia. The *psoas* muscles in the iliac fossa are in relation with the genito-crural and anterior crural nerves, and anteriorly with the common and external iliac artery and vein, and these vessels with the ureter which passes into the true pelvis close to the sacro-iliac joint. The spermatic vessels are anterior to all these structures, and anteriorly and in the lower portion of the fossa the vas deferens is internal to them. The external iliac glands form a chain round the external iliac vessels and communicate by their lymphatics with the femoral glands below and the lumbar glands above. All these structures are covered by parietal peritoneum which forms the internal and anterior wall of the iliac fossa and is continuous with the internal margins of the crural and internal abdominal rings, with the investment of the spermatic cord and, when they exist, with the covering of hernias, and also with the mesentery, mesocæcum, meso-appendix, and meso-ascending colon. This fossa normally contains the organs which these prolongations of peritoneum have just been enumerated as attaching, and also the omentum. Pathologically, the liver, gall-bladder, and kidney may descend into this fossa. The crest of the ilium gives attachment to the erector spinæ, quadratus lumborum, latissimus dorsi, transversalis, and internal and external oblique muscles. The contents of this fossa are walled off anteriorly by the rectus abdominalis and by the last three muscles named: and these muscles—the external and internal oblique and transversalis—are pierced by the ilio-hypogastric and ilio-inguinal nerves,—the ilio-hypogastric first piercing the *psoas* and passing in front of the quadratus lumborum, and the ilio-inguinal first piercing the *psoas* and then passing in front of the quadratus lumborum and the iliacus.

All of the tissues enumerated are subject to inflammation, and, as the following illustrative cases will show, most of them to inflammation or abscess which has, on occasion, been mistaken as being of appendiceal origin.

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¹ Numbers are affixed only to the cases that have been erroneously diagnosed as appendicitis.

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ILLUSTRATIVE CASES.

BONES AND JOINTS.

Vertebræ.—For permission to report the following hitherto unreported case, the writer is indebted to Dr. T. G. Morton.

CASE I.—A woman aged thirty-six years, married, with negative family and past history, began to complain, nine months before, of pain in the right lower abdominal quadrant. This symptom gradually grew worse and a lump developed there. It pointed, and eight weeks prior to her admission to the Pennsylvania Hospital, the diagnosis of appendiceal abscess was made, and an incision above Poupart's ligament on the side evacuated a large quantity of pus. The discharge from this cavity continued to be profuse, and the patient was sent to the hospital suffering from hectic fever, emaciation, and a lost drainage tube in the abscess cavity. As the abscess opening was quite free, and the patient much exhausted by her journey and grave condition, she was kept under observation ten days. During this period her condition at first somewhat improved, but the temperature continued hectic, the discharge very profuse. Vaginal examination was negative; inspection and palpation of the spine were negative. The patient was in bed and too weak to undergo examination of

the spine by manipulation. The exploration of the abscess cavity proved its walls to be within reach of the index-finger, except at its bottom, where a sinus led backward and slightly upward. The lost drainage tube was discovered by the Resident, Dr. Cross, and removed by him. Upon consultation with Dr. Le Conte, it was concluded that the diagnosis lay between appendicitis, psoas abscess, and abscess of tube or ovary. Exploratory operation was decided upon and performed with Dr. Le Conte's assistance. Under ether anæsthesia, the incision was enlarged about five inches upward and backward, along the crest of the ilium, so that, if the abscess should prove extraperitoneal, the peritoneum might not be needlessly entered. The cavity was found to extend backward and upward, to be extraperitoneal, and about eight inches in extent. It was found to be within the sheath of the psoas muscle. The patient's condition was so bad that the cavity was packed, and no further exploration made. Previous conditions became aggravated and the patient died six days later. The autopsy not only confirmed the operative diagnosis of psoas abscess, but discovered that the latter was of vertebral origin, and, though of considerable extent, was unaccompanied by deformity.

Sacrum and Ilium.—To Dr. J. Chalmers Da Costa the writer is indebted for the notes of the following hitherto unreported case.

CASE II.—A man of twenty-three years, a foreigner, was left at the Jefferson College Hospital with a history of pain of some weeks' duration in the right lower abdomen. He exhibited on examination an abdomen that was rigid in the right lower quadrant, and contained a mass discernible on palpation and dull on percussion. There was much gastric disturbance, and there was elevation of temperature. The diagnosis of appendicitis was made. Dr. Da Costa operated, found the appendix normal, and drained an abscess arising from disease in the sacro-iliac joint.

Ilium and Femur.—Dr. John G. Clark, who saw this hitherto unreported case as consultant and operator, has kindly furnished the writer with the following notes.

CASE III.—A woman aged about forty-three years, who had borne four children and did her own housework, had suffered with

pain, considerable leucorrhœa, and marked uterine prolapse for six months. At the end of this period, Dr. Clark saw the patient in consultation, and found the uterus fixed in the pelvis and connected with an inflammatory mass which filled up the right pelvic quadrant, and pointed at McBurney's point. There was board-like hardness of the rectus muscle, and retraction of it occurred on palpation. There was pain in the right abdomen running down the back of the right thigh, but not affecting the knee. This pain had been mistaken for sciatica. The hip-joint was not examined, and there was no complaint that led to suspicion concerning it. The patient was at this time in bed. The abdominal mass lay between the uterine and the pelvic wall and pushed the uterus to the left; the mass was distinctly fluctuating, and it extended as high as McBurney's point, and it pointed there. The case was diagnosed as pelvic abscess of tubal or appendiceal origin. Removal to a hospital and immediate operation were advised. This was refused, but consent was given, a week later, to operation at the patient's house.

Under ether anæsthesia, an incision over McBurney's point evacuated a quart of thick, yellowish pus. The abscess sac was found to communicate with a jagged opening into the acetabulum. The abscess was extraperitoneal. It was drained by gauze, and weight extension applied to the right leg for six weeks. The patient was ambulant in three months. The fistula closed in six months. With the exception of a slight limp, the patient's gait was very good. There was about an inch and a half shortening, no indication of marked fixation, and the patient was able to resume her laborious household duties.

Revised diagnosis: Purulent osteitis of the hip-joint with perforation of the acetabulum.

LESIONS OF MUSCLES.

Iliacus Muscle.—CASE IV.—The President of the Academy (*Proceedings of the Philadelphia County Medical Society*, October, 1894), as already alluded to, reported four iliac abscesses, non-spinal in origin. He says: "I have seen a number of these pus accumulations either from direct or indirect violence," and again, "In the majority of cases a rupture of some fibres of the iliacus probably takes place, suppuration follows, and the pus slowly makes its way downward towards

Poupart's ligament." He remarks of one of the cases he reports: "The pus was at first believed to have originated from an appendicitis, but this supposition was afterwards proved ungrounded."

Psoas Muscle.—For the notes of this hitherto unreported case the writer is indebted to Dr. Taylor, Senior Resident at St. Joseph's Hospital.

CASE V.—A woman aged thirty-six years, with a negative family history, and a recent past history of vague pains in the back and shoulders, was admitted to this hospital with hectic temperature and complaint of pain in the right lower abdominal quadrant, but not limited to McBurney's point. There was at first no swelling, but there was tenderness on deep pressure, and this tenderness was not most marked at McBurney's point. There was no muscular rigidity. The thigh could not be fully extended and was partially flexed. Five days after admission to the hospital, she was operated upon for appendicitis. The appendix, though normal, was removed, and a fluctuating mass was found beneath the parietal peritoneum of the right iliac fossa. This abscess cavity was drained through thigh and abdomen, and existed within the sheath of the psoas muscle. The patient made complete recovery, but the note is wanting whether the vertebræ were at fault. The promptness and completeness of recovery suggest that it was probably purely muscular in origin. Revised diagnosis should be that of psoas abscess.

External and Internal Oblique.—CASE VI.—Sonnenburg (*Berliner klinische Wochenschrift*, 1897, xxiv, 810) reports the case of a boy, aged seventeen years, whose trouble had been primarily diagnosed as appendicitis. At his last attack, he complained of pain in the lower part of the right side of the abdomen, and a week later, immediately following a bowel movement, he was seized with violent pain in the right lower quadrant of the abdomen. He exhibited a little fever, a good pulse, slight abdominal distention, and a hard mass on the right side extending from the outer border of the rectus to the outer border of the abdomen. Tenderness existed over this mass, and dulness on percussion was continuous with that of the liver in the axillary line, but not in the mammillary. The diagnosis was then made of acute appendiceal abscess. On operation an abscess was discovered, but it was confined between the external and internal oblique muscles. The pus was yellowish-white, odorless, sterile, and containing muscle fibres. The peritoneum was normal and unopened. The patient recovered, and the diagnosis was revised to chronic interstitial myositis of the abdominal wall.

CASE VII.—J. A. Hopkins (*New England Medical Monthly*, April,

1900, 121) reports the case of a woman whose past history was not stated, and whose symptoms suggested appendicitis. She exhibited pain in the right iliac fossa, and she suffered from swelling and tenderness. The possibility of appendicitis was kept in mind, but the diagnosis was limited to that of abscess of the abdominal wall. She was treated expectantly with poultices, and the sequel proved the abscess limited to the abdominal wall.

NERVES.

Iliohypogastric and Inguinal.—R. T. Morris (*New York Medical Journal*, 1899, i, 469) says that some of the diagnoses made primarily and erroneously as appendicitis are neuralgias of the ilio-inguinal and iliohypogastric nerves of the right side, and that in these cases procrastination is requisite for correct diagnosis.

CASES VIII, IX.—Janeway (*Medical Record*, 1900, lxxvii, 897) says that neuralgias of the nerves of the right side of the abdomen (involving the lower abdominal nerves) can usually be recognized by close observation, but within his knowledge two operations in two cases had been undertaken for the removal of the appendix, but were uncompleted, because of its healthy condition in each instance, the misleading symptoms being ascribed to neuralgias of unknown cause.

He also comments upon neuralgias in cases of right-sided pneumonia being referred to the right iliac fossa, and likewise mistaken for appendicitis.

Lumbo-Abdominal.—CASE X.—Albert Abrams (*Occidental Medical Times*, 1898, xii, 281) reports that in a case diagnosed as appendicitis and recommended for operation, a local anæsthetic in the form of a freezing mixture was sprayed over the sensitive nerves at their exit from the vertebral column. The appendiceal symptoms, including a circumscribed sensitive swelling in the ileocaecal region, disappeared, and the diagnosis was revised to that of lumbo-abdominal neuralgia.

Sympathetic Neuralgia in Diseases of Lung and Pleura.—CASES XI to XXI.—Mirande (*Thèse*, Paris, 1900) reports ten cases of disease of the lung and pleura, which at the period of invasion were diagnosed as appendicitis. Pain and other symptoms referred to the iliac fossa were typical and pronounced. The chest symptoms seemed of secondary importance. Yet in all these cases—in some at operation, in others at autopsy—the appendices were found to be normal.

CASE XXII.—Brewer (*ANNALS OF SURGERY*, 1901, xxxiii, 601) reports a case of Dr. Evans, seen in consultation by Drs. Janeway, Bull, and Brewer. They concurred in the opinion that the case was one of peritonitis due to appendicitis or cholecystitis. The post-mortem examination showed that not only the appendix, but the abdominal organs were free from inflammation, and that the case was one of pneumococcic septicæmia.

CASE XXIII.—Morris (*New York Medical Journal*, 1899, i, 470) reports a case upon which he operated for appendicitis—the exploration of the abdomen was negative and the case proved to be one of pneumonia. He later saw a case with similar symptoms in which the diagnosis of pneumonia was correctly made.

Hysteria.—CASES XXIV to XXX.—Morris (*New York Medical Journal*, 1899, i, 470); Thalamon (*Bull. Soc. Méd. des Hôp.*, 1897, xiv, 430); Rendu (*Bull. Soc. Méd. des Hôp. de Paris*, 406, 1897); Nothnagel (*Wiener klinische Wochenschrift*, 99, 387); Brissaud (*Bull. Soc. Méd. des Hôp. de Paris*, 97, xiv, 414). Seven cases in all exhibited the symptoms of appendicitis and were so diagnosed, three of these cases were operated upon. They all proved to be cases of hysteria.

GLANDS.

Adenitis, Precæcal.—CASE XXXI.—Gérard Marchant (*Bull. et Mém. de la Soc. de Chir. de Paris*, 1900, xxvi, 77) reports three cases, two with previous attacks, and one with a single attack, primarily diagnosed as appendicitis, tubercular appendicitis, and subacute appendicitis respectively. The first had pain in the interval. The second was a typical attack of appendicitis, but exhibited no fever in the last attack. The third was unaccompanied by fever or vomiting, but had persistent pain in the right iliac fossa. The first exhibited tumor in the cæcal region and was tender to the touch; in the second an irregular, elevated mass of firm consistency and movable, was very sensitive to the touch, and believed to contain the appendix. The signs of the third case are unstated. The operation in each instance discovered the appendix and cæcum to be apparently normal, but enlarged glands were discovered in all three cases and enucleated in the first two. In the second case a large suppurating gland was removed by curette and cautery. Each case recovered, and microscopic examination showed the appendix in the first case to be normal and in the second and third cases to be slightly inflamed. The glands in the first instance were caseous; in the second they were probably tubercular. The revised diagnosis in the first case was precæcal adenitis, without appendicitis.

Adenitis, Retrocolic.—CASE XXXII.—Bazy (*Bull. et Mém. de la Soc. de Chir. de Paris*, 1900, xxvi, 133) reports the case of a girl, aged seventeen years, with a previous history of one attack of appendicitis, in which she suffered severe pain in the right iliac fossa. She had but slight elevation of temperature, and exhibited a large mass sensitive to the touch situated in the right flank and iliac fossa. The earlier diagnosis of appendicitis was approved, but on operation the colon was found slightly congested. No mention is made of the condition of the appendix, but behind the peritoneum hard and firm masses were found in the retrocolic region. Prolonged suppuration ensued followed by recovery. The revised diagnosis is specifically stated to be retrocolic adenitis without appendicular lesion.

Adenitis, Retroperitoneal.—CASE XXXIII.—Reynier (*Bull. et Mém. de la Soc. de Chir. de Paris*, 1900, xxvi, 169) reports the case of a man suffering from intestinal obstruction, and exhibiting a mass in the right iliac fossa. The diagnosis was appendicitis. Upon operation a mass of caseous glands was found extending back to the vertebral column. The patient died, and at the post-mortem his appendix was found to be normal. Revised diagnosis: intestinal obstruction due to large, broken-down glands.

Adenitis, Syphilitic.—CASE XXXIV.—R. Condamin and J. Voron (*Arch. Progr. de Chir.* 1900, ix, 311) reports the case of a girl, aged seventeen years, who for two years had suffered abdominal pain, sometimes on

the left and sometimes on the right side. In the June of 1899 she contracted a labial chancre, and later developed secondary symptoms. In October she suffered from severe pain in the right iliac fossa; she exhibited tenderness there and vomited once. Other appendiceal symptoms were wanting. The pain lasted for months, for a while without influence on her general health, but latterly she did badly. Examination in January showed great tenderness over McBurney's point; the abdominal wall was rigid; no mass was detected; vaginal examination was painful in the posterior cul-de-sac. She also exhibited secondary specific eruptions. Diagnosis was made of appendicitis with possibly a retrocæcal abscess, but operation discovered the appendix and abdominal organs to be normal, with the exception of the glands, which were slightly enlarged. She recovered from the operation, but not from her symptoms prior to it. Mercurial inunctions were instituted, and all symptoms disappeared. The revised diagnosis being syphilitic adenitis in the right iliac fossa.

Tonsillitis.—CASE XXXV.—Janeway (*Medical Record*, 1900, lvii, 898) reports that he saw a case for a complication in which the diagnosis of appendicitis had been proved in error, by operation, the subsequent course of the case proving it to be one of tonsillitis.

PERITONEUM.

General Peritonitis.—CASE XXXVI.—R. T. Morris (*New York Medical Journal*, 1899, i, 470) reports the case of a boy of ten years with a history of recent measles, who was suddenly seized with all the symptoms of acute peritonitis. The diagnosis was made of appendicitis with general suppurative peritonitis. Operation discovered the peritoneum thickened, infiltrated, but not reddened, and its cavity filled with viscid lymph, but the appendix normal. A protracted recovery was followed by an attack of meningitis accompanied by pleurisy and pericarditis. The diagnosis was revised to general serositis sequent to measles.

Omental.—For the notes of the following hitherto unreported case, the writer is indebted to Dr. T. G. Morton.

CASE XXXVII.—A woman was admitted to the Pennsylvania Hospital with a history of one day's illness, four days of absolute constipation, and of an eight years' right-sided inguinal hernia. She had vomited twice on the day she was admitted to the hospital. Her abdomen was enormous, she had pain in the appendiceal region, and was so tender there that palpation for a mass could not be performed satisfactorily. She appeared to be in a condition of shock. The diagnosis of appendicitis was at once made and followed by incision under ether in the appendiceal area. The appendix was found to be normal and was left undisturbed. The cause of trouble was a large mass of omentum weighing about

two pounds, which was in a gangrenous condition. This mass was ligated and removed. The woman's condition forbade further exploration. Distention followed the operation. Constipation remained absolute for three days, when her bowels yielded to two minims of croton oil given in quarter-minim doses. She died later on that day.

T. H. Manley (*Journal of the American Medical Association*, 1901, i, 1547), speaking of appendicitis in children, says among other things that in tubercular peritonitis, when limited to the mesentery or parietal peritoneum, and associated with intestinal paresis or ascites, it cannot be determined, prior to operation, whether or not the appendix is involved. Often have operations revealed no lesions of this organ. The acute fulminant type of tubercular peritonitis begins in the peri-appendiceal lymph tissue contiguous with the cæcum.

Tubercular.—CASE XXXVIII.—R. T. Morris (*New York Medical Journal*, 1899, i, 469) reports the case of a young woman suffering from recurrent attacks of appendicitis for two years, which upon operation in the interval and removal of the appendix was discovered to be miliary tuberculosis, and the diagnosis was so revised, the appendix being found normal, excepting that its peritoneal coat, like the rest of the peritoneum, was studded with miliary tubercles.

CASE XXXIX.—R. T. Morris (*New York Medical Journal*, December 22, 1900, 1093) reports two cases diagnosed as appendicitis, but which proved on operation to be suffering from tuberculous peritonitis; the appendices, not being particularly involved, were not removed.

VESTIGES AND DIVERTICULA.

The following quotation from the "American Text-Book of Surgery," 1899 (p. 760), written for its bearing upon appendicitis, applies with equal force to the cases reported under the above heading: "There can be no question that those structures which remain to us as functionless vestiges of parts once useful in our prehistoric ancestors are possessed of low vitality and but feeble resisting powers."

Vitello-Intestinal Vestige.—CASE XL.—Friend (*Philadelphia Medical Journal*, 1899, iv, 181) reports the case of a girl, aged thirteen years, having a history of alternate constipation and diarrhœa. Her condition was primarily diagnosed as having being due to appendicitis or a strangulated intestine. She exhibited at her last attack, twenty-three days before, nausea, constipation, and a sudden violent pain in the abdomen. There was no vomiting, and the bowels later were moved by enemata. Improvement resulted until injudicious eating provoked nausea, vomiting, and an intense umbilical pain, followed by a purulent discharge from the umbilicus. Upon operation general peritonitis was discovered, but no strangulation and no pus; the appendix was slightly congested, and behind it was

found an abscess. She died, and microscopical examination of the appendix pronounced it normal. The diagnosis was revised to iliac abscess due to infection of the vitello-intestinal vestige through the intestine.

Testicular Funicular.—The writer is indebted to Dr. Wm. C. Lott for the notes of this hitherto unreported case.

A boy, aged sixteen years, kicked in the right iliac region at 9 A.M., while playing football, woke up at midnight with a chill followed by fever, sweating, nausea, vomiting, and sharp abdominal pain, most severe in the right iliac region, where there was much tenderness. Diarrhœa ensued on the following day, and he was admitted to the Presbyterian Hospital on the evening of the second day, on which he suffered less pain, but still exhibited tenderness. His temperature on admission was 100.6° F. and his pulse 112. A distinct mass was discernible in the right iliac fossa, just below McBurney's point. In this region there was dulness on percussion as far as the median line. There was no discoloration of the skin and the mass was evidently within the abdomen. While these symptoms pointed to appendicitis, that diagnosis was withheld on account of the clear traumatic history. Operation was performed by Dr. Lott assisted by Dr. Porter on the morning of the third day. The following entry in the history was personally made by Dr. Lott.

"A mass of tissue was found extending down to and apparently entering the internal abdominal ring. This mass contained the abscess, which was discovered after some searching and evacuated. It is my belief that the apparently fibrous mass composing the walls of the abscess was the incompletely obliterated tissues of the funicular process of the peritoneum which covers the testes and cord in embryo, and which sometimes remains in the abdominal cavity after the descent of the testes. The appendix was found rather low in the pelvis, was dangling freely in the cavity, and was absolutely normal. It was removed because of its proximity to the abscess." The cavity was drained, and the patient recovered. Diagnosis: traumatic peritonitis arising in the unobliterated funicular process that covers the testes in embryo.

Diverticula.—CASES XLI to LIX.—These may be summarized as eighteen cases in which a primary diagnosis of appendicitis was revised at operation or post-mortem examination to that of intestinal obstruction due to trouble involving Meckel's diverticulum. Fifteen of the cases were operated upon, of these eight were fatal. The total mortality was ten. In two of the eighteen cases the result was un-

recorded. These cases are reported by the following observers :

- Schmidt: *Deutsche Zeitschrift für Chirurgie*, 1899, xliv, 144.
 Routier: *Bull. et Mém. de la Soc. de Chir. de Paris*, 1897, xxxiii, 645.
 Bergman, cited by Sonnenburg: *Berliner klinische Wochenschrift*, 1897, xxiv, 810.
 Morton: *Lancet*, i, 452, February 17, 1900.
 Gildersleeve: *Medical News*, 1898, 392.
 Carminiti, *Gaz. degli. osp. c. delle Chiriche*, November 18, 1900.
 Guinard: *Bull. et Mém. de la Soc. de Chir. de Paris*, 1898, xxiv, 189.
 Nicholson: *New York Medical Journal*, 1900, June 23.
 Thurstan: *Lancet*, ii, p. 1799, December 22, 1900.
 Mintz: *Deutsche Zeitschrift für Chirurgie*, xliii, 301.
 Elliot: *Boston Medical and Surgical Journal*, 1894, cxxx, 586.
 Alberti: 71. Vers. d. Nat. u. Aerzt., München, 1899.
 Dennis: Two cases cited by Gildersleeve, *Medical News*, *loc. cit.*
 Mixter, cited by "Dennis's Surgery," Vol. iv, p. 296.
 Fowler: "Appendicitis," 1894.
 Picque: *Cong. Franc. de Chir.*, 1897, xi, 480.
 Darnall: *New York Medical Journal*, p. 62, January 12, 1901.

COLON.

Impaction.—CASE LX.—Dorsett (*Transactions of the American Association of Obstetrics and Gynecology*, 1896, ix, 76) reports a case primarily diagnosed as appendiceal abscess, and revised, after operation discovering the appendix to be normal, to that of fecal impaction of the colon.

Ulcer, Perforative, following Impaction.—CASE LXI.—Le Dentu (*Bull. et Mém. de la Soc. de Chir. de Paris*, 1900, xxvi, 185) reports the case of a woman, aged twenty-three years, giving a past history of gastric pain, vomiting, and chronic constipation throughout four years, and pain in the appendicular region throughout the past year. The diagnosis of appendicitis had been made, and the following symptoms were exhibited at her last attack. Violent pain existed in the region of the stomach and kidney, and the ingestion of any food was followed by vomiting. These symptoms persisted three days, when violent pain was experienced at the site of McBurney's point. Pain was aggravated by pressure, and the appendix was not discerned on palpation. On operation, the cæcum, liver, bile-ducts, gall-bladder, and stomach were found normal; also the appendix. The latter, however, was removed, and was found normal on pathological examination. In the upper part of the right iliac fossa the large intestine was bound down by adhesions; these were severed and a small perforation discovered. The diagnosis of appendicitis was revised to stercoral ulcer in the ascending colon.

Perforation from Foreign Body.—CASE LXII.—B. B. Davis (*Journal of the American Association*, 1900, ii, 904) reports a case in which the accidental swallowing of a bone was followed in four days by pain in the right side of the abdomen, constipation, vomiting, general tympanites, with

marked dullness on percussion from McBurney's point to the floating ribs. Progressive emaciation ensued. Malignant disease was suspected. Incision showed the ileocæcal junction and appendix to be normal, but that there was a perforation in the colon and behind it an inflammatory mass containing pus and fæcal matter. The bone was not found. Revised diagnosis, perforation of the colon, probably caused by a foreign body.

Malignant Disease.—CASES LXIII, LXIV.—Charrier (*Bull. et Mém. de la Soc. de Chir. de Paris*, 1900, xxvi, 924) and Mühsam (*Berliner klinische Wochenschrift*, 1899, xxxvi, 676) each report cases in which the primary diagnosis of appendicitis was revised on operation to that of carcinoma. The hepatic flexure in Charrier's case and the sigmoid flexure in Mühsam's case were the regions involved.

CÆCUM.

Foreign Body.—CASE LXV.—Mumford (*Boston Medical and Surgical Journal*, 1899, cxli, 602) reports the case of a girl of twelve years seized three days before with sudden abdominal pain referred to the umbilicus. She vomited six hours after the onset of pain, which was especially severe in the right iliac fossa and extended to the back; her bowels were freely moved with castor oil, but the pain only increased in severity. On the third day her temperature was 103° F.; pulse, 112; her abdomen was distended; its muscles were rigid, exhibited spasm, and were especially tender over McBurney's point. Rectal examination was negative. Diagnosis of appendicitis was followed by operation, discovering the appendix normal; likewise the cæcum, except that it was distended. Incision into it revealed a compact mass of orange pulp, which was removed; the patient recovered, and the primary diagnosis of appendicitis was revised to that of foreign body in the cæcum.

Enteroliths.—CASE LXVI.—Goldbach (*Prager medicinische Wochenschrift*, 1898, xxiii, April 21) reports the case of a boy of sixteen years, a gymnast, whose past history told of jaundice, vomiting, frequent colicky pain beneath the right costal margin, coexistent with constipation. These symptoms were subject to improvement and were of a year's duration. The history of his last attack dealt with pain in the ileocæcal region and back, constipation, flatus, and tenderness at McBurney's point. Examination revealed slight distention, dullness in the ileocæcal region, where a movable, resisting, soft mass was felt. The diagnosis was made of chronic appendicitis. Operation discovered the appendix and cæcum to be normal, but the latter contained a few fæcal stones. The primary diagnosis of appendicitis was revised to that of cæcal enteroliths.

Intussusception; Ileocolonic.—CASE LXVII.—Mühsam (*Berliner klinische Wochenschrift*, 1899, xxvi, 676) relates the case of a little boy of five years of age, who a year previously had suffered with pain in the right iliac fossa, and also with nausea and vomiting. The recent attack had begun with sudden violent pain in the right iliac fossa and was accompanied by diarrhœa. Vomiting, but not of fæcal character, occurred on the following day, during which there was no bowel movement. On the third day symptoms of peritonitis and collapse set in. The abdomen was flat and not tender, except in the right iliac fossa, where a resisting mass as

large as the fist could be felt, and it was dull on percussion. The diagnosis of perforative appendicitis was made. Collapse and death ensued. The post-mortem examination revealed the appendix to be normal, but the ileum was found to invaginate the ascending colon, and the diagnosis was accordingly revised.

Ulceration.—E. G. Janeway (*Medical Record*, 1900, lvii, 897) says varieties of ulcers, perforative and non-perforative, have been mistaken for appendicitis, and that he has known of operations for the removal of the appendix in cases in which the cæcum and neighboring peritoneum were the seat of tubercular inflammation.

Dr. W. Joseph Hearn (*Transactions of the Philadelphia Academy of Surgery*, 1899, i, 11) reports a case described as "Pericæcal Abscess without Appendicitis." The abscess was between the cæcum and the parietal peritoneum, and the appendix was three inches distant from the abscess. The cæcum at the inflammatory focus was almost gangrenous; the appendix on microscopical examination exhibited inflammatory change in its mucous and submucous coats, but not in the muscular and peritoneal. The inflammation observed in the appendix Dr. Hearn considered secondary to the trouble in the cæcum. Dr. John Ashhurst, Jr., reported a similar case, and one with less involvement of the appendix. As both these cases are of mixed character, they are not numbered as cases in illustration to the reply to this inquiry.

Perforative Ulcer.—CASES LXVIII to LXX.—Vincent (*Lyons Méd.*, 1900, xciv, 526), Monod (*Gaz. des Hôp.*, 1891, lxxi, 353), Delbet (*Bull. et Mém. de la Soc. de Chir. de Paris*, 1900, xxvi, 170) report three cases respectively diagnosed as appendicitis with local peritonitis, appendiceal abscess, and appendicitis with general peritonitis. The first had a history of a kick in the abdomen a month before, the second exhibited a fluctuating mass in the right iliac fossa with tenderness most marked at McBurney's point; the signs in the third case were described as typical. Operation in the three cases revealed normal appendices and cæcal perforation. The primary diagnosis of appendicitis was revised from appendicitis to perforating cæcitis.

Perforation and Malignant Disease.—CASE LXXI.—Janeway (*loc. cit.*) mentions the case of a man he saw in consultation. Appendicectomy was prevented by fatal collapse. The autopsy revealed a colloid carcinoma of the cæcum with a perforated ulcer of the intestines, and the diagnosis was so revised.

Tumors.—CASE LXXII.—Sonnenburg (*Berliner klinische Wochenschrift*, 1897, xxiv, 810) reports a case diagnosed as appendicitis which on operation proved to be a fibromyoma of the cæcum.

CASES LXXIII, LXXIV.—Mühsam (*Berliner klinische Wochenschrift*, 1899, xxxvi, 676) and Coley (*ANNALS OF SURGERY*, 1901, xxxiii, 631) were each diagnosed as appendicitis. On operation, in each instance, a carcinoma of the cæcum was discovered and the appendix found to be normal.

CASES LXXV, LXXVI.—Coley (*ANNALS OF SURGERY*, 1901, xxxiii, 631) and McCosh (*loc. cit.*, 630) were each diagnosed as appendicitis, but were discovered by operation to be sarcoma of the cæcum.

ILEUM.

Foreign Body.—CASE LXXVII.—Th. Weiss (*Rev. Méd. de l'Est.*, 1900, Feb. 15, 111) reports the case of a man aged thirty-five years, diagnosed as having appendicitis, and who had complained of pain in the right iliac fossa for two months. He was without fever, and did not vomit, but he could not work or even move without exciting severe pain in the ileo-cæcal region. His abdomen exhibited marked rigidity and some induration over the region of the appendix; it was dull on percussion, and tenderness was most marked over McBurney's point. Operation discovered the appendix to be normal, but in the small intestine near the ileo-cæcal valve a bone, pointed at one extremity and the size of a two-franc piece, was found and removed by incision. The primary diagnosis of appendicitis was revised to that of foreign body in the ileum.

Lead Ileus.—CASE LXXVIII.—J. P. Lord (*Journal of the American Medical Association*, 1899, i, 800) reports a case of appendicectomy in which the appendix showed no signs of recent inflammation, but in which the ileum was contracted, the condition being due to lead poisoning.

CASES LXXIX, LXXX.—Murphy (*Journal of the American Medical Association*, January 4 and 11, 1896) and Le Gendre (*Lancet*, July 29, 1899) are similar cases.

Inflammation, Acute.—CASE LXXXI.—Quénu and Cavasse (*Bull. et Mém. de la Soc. de Chir. de Paris*, 1900, xxvi, 82) report the case of a boy of seventeen years with a negative abdominal history until three days before he came under observation. He then exhibited constant bilious vomiting, accompanied by violent abdominal pain and obstinate constipation throughout two days, at the end of which time his bowels were moved by enemata. On that evening his face was Hippocratic, there was slight abdominal distention, pain on pressure in the right iliac fossa, and contraction of the right side of the abdomen. There was slight fever. Diagnosis was made of appendicitis. Incision in the right iliac fossa, and subsequent microscopic examination, discovered the appendix normal, but the small intestines were congested and covered with a slight exudate, especially over the lower part of the ileum. The patient recovered, and the primary diagnosis of appendicitis was revised to that of inflammation of the ileum with localized peritonitis.

Inflammation with Adhesions.—CASE LXXXII.—Fowler ("Appendicitis," 1894, p. 120) reports a case with appendiceal symptoms operated upon by Dr. Delatour. The appendix was found to be normal, but the small intestine was bound down by old adhesions posterior to the cæcum. Separation of the adhesions was followed by recovery.

Perforation.—CASE LXXXIII to LXXXV.—Aimé Guinard (*Dentu and Delbet*, Vol. vii, p. 490), J. B. Deaver ("Appendicitis," 1900, chapter on Differential Diagnosis, p. 201), Kirmisson (*Bull. et Mém. de la Soc. de Chir. de Paris*, 1898, xxiv, 279), report, respectively, the following three cases: The first, that of Guinard, exhibited all the signs of appendicitis with suppuration. The second, that of Deaver, had eaten a hearty meal, which was followed by acute abdominal pain centring round the umbilicus, nausea, vomiting, and bile-stained urine; the symptoms improved on

the following day, but by evening all the symptoms of appendicitis developed and the signs of general peritonitis. The third, that of Kirmisson, complained of pain referred to the right iliac fossa, accompanied by vomiting and constipation, marked tympanites, and fever. Excepting the temperature, the symptoms had grown progressively worse, and there was a mass in the iliac fossa. The case of Guinard was operated upon and died; the post-mortem discovered the cæcum and appendix normal; there was a perforation in the ileum thirty centimetres from the ileocæcal junction, the size of a fifty centime piece. In the case of Deaver, diagnosed as acute appendicitis with general peritonitis, operation was deferred in the hope of reaction, but death occurred, and the post-mortem showed the appendix and gall-bladder to be normal, but the ileum to be perforated. General peritonitis existed. In the case of Kirmisson, the diagnosis of appendicitis was modified on anæsthetization to that of localized peritonitis. Examination with the patient anæsthetized confirmed the presence of the mass, which was of regular outline, unfluctuating, of the size of an orange, and slipping on palpation to the left side just below the umbilicus. A median incision discovered intestinal obstruction and a small perforation at the junction of the contracted and dilated ileum. The patient recovered.

The primary diagnosis of appendicitis in these three cases was revised to that of perforation of the ileum; and the last case was caused by intestinal obstruction.

CASE LXXXVI.—Barb (*Thèse*, Paris, 1895 [Letulle and Monod]) reports the case of a man of forty-two years of age, who for two weeks suffered with fever, diarrhœa, alimentary vomiting, pain in the right flank, hypochondrium, and in the cæcal region, where it was most severe. A hard, indurated mass tender to the touch was discernible in the right iliac fossa. The diagnosis was made of localized appendiceal abscess. On incision the cæcum was found congested, the appendix was not seen, but the omentum was infiltrated, and behind it was a small cavity containing gangrenous *débris* and a sanious fluid, but no true pus. The cavity was cleaned and drained. Death occurred a month later. The autopsy discovered the appendix normal, but there was a large perforation in the small intestine at the level of the ileocæcal valve and communicating with retro-cæcal abscess cavity. There were other abscesses and a general peritonitis. The cause of the ulceration was unknown; it was not considered typhoidal or tubercular. The diagnosis was revised to perforating ulcer of the ileum.

CASE LXXXVII.—Mühsam (*Berliner klinische Wochenschrift*, 1899, xxxvi, 676) reports the case of a woman who in six months had suffered two attacks diagnosed as appendicitis. There were fever, pain, and a resistant mass in the right iliac fossa. Operation discovered an abscess containing faecal pus and a needle. The intestine exhibited several minute perforations.

The Typhoid Ulceration of Peyer's Patches.—CASES LXXXVIII to XCI.—Richardson (*Providence Medical Journal*, April, 1901, p. 65) reports four cases, two of which were recommended for appendicectomy and two of which

were operated upon. The revised diagnosis was typhoid fever in each instance. The following is an abstract of the last case.

A girl ill for a week exhibited marked tenderness in the right iliac fossa, little rigidity, and some resistance upon deep pressure on the right side of the abdomen. The attack began with a chill, headache, and abdominal pain. The diagnosis lay between typhoid and appendicitis. Palpation with the patient anæsthetized revealed an ill-defined mass, probably an inflamed appendix, in the right iliac fossa. Incision discovered the cæcum and appendix to be normal, and the mass to consist of seven or eight enlarged, juicy, reddish lymph glands clustering about the ileocæcal valve. A resistant mass that felt like a tubercular ulceration was located in the small intestine. This was believed to be the primary lesion and the enlargement of the glands to be secondary.

The diagnosis in this case was revised to typhoidal ulceration of the ileum by the pathologist who examined the glands, and who congratulated Dr. Richardson upon the "earliest diagnosis of typhoid on record."

CASES XCII, XCIII.—H. A. Hare (*Transactions of the American Physicians*, 1900, xv, 193) reports two cases of similar history. The notes of the first case are as follows: A boy, twenty-one years of age, exhibited pain and much tenderness in the right hypochondrium and epigastrium for a few days. His abdomen was scaphoid; he had slight fever and a rapid pulse. His pain became worse on the following day and more limited to the appendicular region. There was hardness and rigidity of the abdominal wall and marked tenderness over McBurney's point. The operation which was arranged for that afternoon was delayed because the tongue became suggestive of typhoid, which later developed, and the diagnosis was revised from appendicitis to that of typhoid.

CASE XCIV.—John B. Walker (*ANNALS OF SURGERY*, 1901, xxxiii, 633) and Gabriel Maurange (*Gazette Hebd. de Méd. et de Chir.*, 1899, xlv, 925) each report one case in which a primary diagnosis of appendicitis was followed by operation, and the discovery of a cæcal ulcer in the first case and enlarged retrocæcal glands in the second. Both cases developed typhoid fever, and the primary diagnosis of appendicitis was revised to that of typhoid fever. The appendix in the second case was removed; its microscopic examination suggested that it had been subject to chronic atrophic inflammation.

CASE XCV.—John B. Walker (*loc. cit.*) also reports in the same article a case diagnosed as appendicitis. Operation set for the following day was prevented by the development of typhoid symptoms. The case proved fatal in six weeks from hæmorrhage.

CASES XCVI to XCVII.—Morris (*New York Medical Journal*, 1899, i, 469) and Mühsam (*Berliner klinische Wochenschrift*, 1899, xxxvi, 676) each report a case in which a primary diagnosis of chronic appendicitis was made in the first instance and of appendicitis with peritonitis in the second. The first case went to operation, and adhesions of the cæcum and appendix were separated and the latter removed. These evidences of local peritonitis were ascribed to a broken-down Peyer's patch occurring during an attack of typhoid fever, microscopical examination of the appendix proving it to be normal. Mühsam's case was not operated upon, but at post-mortem section perforated typhoid ulcer was discovered. Primary diagnoses of appendicitis in both these instances were revised to that of typhoid fever.

CASES XCVIII to XCIX.—Alberti (71. Vers. d. Nat. u. Arzt., München, 1899, p. 129), Mühsam (*Deutsche medicinische Wochenschrift*, 1901, xxviii, 534), and Rendu (*Sem. Méd.*, 1901, xxi, 41) each report a case that was operated upon, the first for perityphlitic abscess, the remaining two for appendicitis. The diagnosis in each instance was revised to that of typhoid fever.

Peabody (*Medical Record*, 1900, lvii, 935) and Janeway (*Medical Record*, 1900, lvii, 898) also speak of cases of typhoid that had been operated upon by mistake for appendicitis, but do not describe them.

Malignant Disease.—CASES C, CI.—Brewer (*ANNALS OF SURGERY*, 1901, xxxiii, 590) and Berg (*Medical Record*, 1901, i, 1025) were each diagnosed as appendicitis. Operation proved Brewer's case to be a soft sarcoma of the intestines and Berg's to be a lymphosarcoma of intestine, omentum, mesentery, and glands.

DUODENUM.

Perforating Ulcer.—CASE CII.—Lennander (*Mittheilungen aus den Grenzgebiet der Medicin und Chirurgie*, iv, 105) reports the case of a woman of twenty-five years, a servant, who for several years had exhibited the signs of gastric ulcer. Her symptoms were not severe, and she never suffered from hæmatemesis. History of her last attack is one of severe gastric pain of a few days' duration. The entire abdomen was tender, but was especially so in the region of the cæcum, appendix, and ascending colon, and gave least trouble in the epigastrium. There was general distention. On rectal examination slight fulness was discovered in the right iliac fossa but no evidences of gynæcological disease. Diagnosis was made of peritonitis due either to perforated appendix or gastric ulcer. Incision in the right iliac fossa discovered the peritoneum to be thick and injected, the abdominal cavity to contain a thin and flaky, odorless liquid, and the cæcum and appendix to be normal. The operation proceeded no further than the institution of drainage. Death occurred in three days, and post-mortem examination discovered a large abscess bounded by the abdominal wall, the left lobe of the liver, its suspensory ligament, the transverse colon, and the stomach. A small abscess was located in the lumbar region and ulcers found in the duodenum. Two of these were intact, and one situated near the gastroduodenal junction had perforated. Diagnosis of possible appendicitis was revised to general peritonitis due to perforation of a gastroduodenal ulcer.

CASE CIII.—Mühsam (*Berliner klinische Wochenschrift*, 1899, xxxvi, 676) reports the case of a man of fifty-one years, who eleven years before was said to have had an attack of appendicitis. His present illness was characterized by sudden pain in the right side of the abdomen. He was not nauseated, nor did he pass flatus. On the following day his symptoms suggested grave peritonitis; his pain was greatest in the right iliac fossa and in the gastric region. His abdomen was distended and very tender to the touch. There was no dulness on percussion; no information was gathered from rectal examination, and retention of urine was relieved by the catheter. Diagnosis was made of perforated appendix or gastric ulcer. He died, and post-mortem section revealed a perforated duodenal ulcer. Diagnosis of possible appendicitis was limited to that of duodenal ulcer.

CASES CIV to CXLII.—R. F. Weir (*Medical Record*, 1900, lvii, 934) refers especially to duodenal perforations, of which he collected fifty-one cases, three-quarters of which (thirty-eight cases) had been operated upon for appendicitis.

STOMACH.

Perforating Gastric Ulcer.—CASES CXLI to CXLVI.—Mühsam (*Berliner klinische Wochenschrift*, 1899, xxxvi, 676), Verdet (*Gazette Hebdomadaire de Médecine et de Chirurgie*, 1900, 227), Jacob (*Thèse*, Paris, 1893), and Kammerer (*ANNALS OF SURGERY*, 1901, xxxiii, 632) each report a case in which the primary diagnosis of appendicitis was made. Three of the cases were operated upon, that of Verdet was not, but a post-mortem section was made.

In all four of the above cases the primary diagnosis of appendicitis was revised to that of perforated gastric ulcer.

Gangrenous Polyp.—McCosh (*ANNALS OF SURGERY*, 1901, xxxiii, 629) reports the case of a man with symptoms of general peritonitis and pain in the epigastrium and right iliac fossa, accompanied by fever, tenderness over the appendix, and abdominal distention, who was operated upon for general peritonitis due to perforative appendicitis, and discovered to suffer from general peritonitis due to a gangrenous gastric polyp, and the diagnosis was so revised. The appendix was but slightly and secondarily inflamed.

FOREIGN BODY IN THE ABDOMINAL CAVITY.

CASE CXLVII.—Marx (*Medical Record*, 1899, ii, 868) reports the case of a woman of twenty-eight years who two years before was relieved of a dermoid cyst. At twenty-seven she had an attack of what was styled acute appendicitis, but she was not operated upon. She had three later attacks, the diagnosis was made of acute appendiceal abscess. At the operation an abscess was evacuated, but it arose not from the appendix, but a silk ligature.

HERNIA.

Several cases of hernia that were mistaken for appendicitis have been discovered in the search for reports pertinent to

this paper, but, as the original scope of the paper was limited to abscess, they were rejected, and their references, with the exception of the following, are not now at hand.

Femoral Hernia.—CASE CXLVIII.—Walter C. Wood (*Brooklyn Medical Journal*, 1898, 484) operated on a case referred to him with the diagnosis of appendicitis. He discovered on section that the trouble was due to a properitoneal hernia, only the ring of peritoneum was concerned in the constriction. The gut involved was only a portion of the circumference of the ileum; the lumen of the gut was not occluded, *i.e.*, the hernia was of the Littré variety. The location was that of the femoral canal, but the canal was not entered by the hernia.

Retroperitoneal Hernia.—CASE CXLIX.—Fowler ("Appendicitis," 1894, p. 119) reports a case of rare interest with appendiceal symptoms which were found by operation to be due to hernia of a portion of the ileum into the fossa duodenojejunalis of Treves, the musculus suspensorius duodeni of Treitz acting as a band. The case ended fatally.

SPLEEN.

Abscess.—CASE CL.—Mühsam (*Berliner klinische Wochenschrift*, 1899, xxxvi, 676) reports the case of a woman of twenty years, having tuberculosis of the lungs and an enlarged liver, who suffered for three weeks with severe gastric pain. There was dulness in the right iliac fossa, which contained a resisting mass the size of a man's fist. This mass was tender to the touch; percussion discovered dulness extending as far as the left side of the abdomen, the bladder being empty at the time. Vaginal examination confirmed the presence of a fluctuating tumor. Diagnosis was made of a post-appendiceal abscess. On incision, and apparently before the peritoneum was reached, an abscess cavity was opened, and from it came odorless pus. No intestine was visible. Death occurred in two weeks, and post-mortem examination discovered a chronic adhesive peritonitis with multiple abscesses "and suppuration of the stomach and spleen;" also a purulent thrombophlebitis of the portal vein and other inflammatory lesions. The primary diagnosis of appendicitis was revised to that of splenic and gastric abscess.

PANCREAS.

Suppuration.—CASE CLI.—Brewer (*ANNALS OF SURGERY*, 1901, xxxiii, 590) reports the case of a man of fifty-three years who had exhibited abdominal symptoms for a year. Seventeen years before an attack of abdominal pain and fever had been styled acute peritonitis. He was recently suddenly seized with abdominal pain, which gradually grew worse, and was accompanied by vomiting, malaise, fever, and sweat, but not by jaundice. His abdomen was distended. It was generally tender; there was no suggestion of its containing a mass or free fluid. Examinations of the rectum, of the liver, and of the urine were negative. The diagnosis was made of peritonitis due to a perforated appendix. On incision, there was no evidence of general peritonitis, and the pancreas, gall-bladder, and appendix appeared to be normal. The omentum was covered by numerous

small white spots. Microscopic examination showed one of these to be subject to fat necrosis. The patient died. At the post-mortem the pancreas was found to contain numerous small abscesses. The primary diagnosis of appendicitis was revised to that of acute suppurative pancreatitis.

KIDNEY.

Floating Kidney.—E. G. Janeway (*Medical Record*, 1900, lxxvii, 897) says that fæcal impaction in cases of narrow hepatic flexure is often associated with movable right kidney, and the condition mistaken for appendicitis. He has also known intermittent hydronephrosis without calculus, hydronephrosis with displaced right kidney, and movable kidney to be mistaken for appendicitis. Finally, he has known operations for appendicectomy to be instituted in cases that were subsequently discovered to suffer from renal colic.

CASE CLII.—Miller (*Medical Record*, 1900, lvii, 363) reports the case of a woman of forty-four years of age, a servant, who had suffered with pain in the right iliac fossa for one year. There was a distinct mass in the fossa, and there was tenderness one inch below McBurney's point. The diagnosis was made of appendicitis or ovarian tumor. Operation proved both the appendix and ovary to be normal, but discovered a right-sided floating kidney, and the diagnosis was so revised.

CASES CLIII, CLIV.—Morris (*New York Medical Journal*, December 22, 1900, 1093) and Wright (*American Journal of Surgery and Gynecology*, 1901, xiv, 86) each report a case in which the primary diagnosis of appendicitis was responsible for operations that discovered normal appendices, but floating kidneys, and the diagnoses were so revised.

Hydronephrosis.—It is of interest to note that in Wright's case, the supposed appendiceal inflammatory mass disappeared on anæsthetization, which was followed by a copious discharge of urine. The notes of the case thus explained the phenomena observed: A floating kidney twisting on its pedicle resulted in hydronephrosis mistaken for appendicitis. The relaxation of anæsthetization permitted untwisting of the pedicle, relief from constriction, the escape of urine to the bladder and disappearance of the hydronephrosis.

Pyonephrosis.—CASE CLV.—Marx (*Medical Record*, 1899, ii, 868) reports the case of a girl seized with sudden pain in the right iliac fossa, and who exhibited abdominal tenderness, a temperature of 102° F., and a pulse of 108, and was pronounced to be suffering from appendicitis. Incision discovered the appendix to be normal, but that back of the peritoneum there was a suppurating cavity. Two days later a suppurating kidney was removed. The patient recovered, and the primary diagnosis of appendicitis was revised to that of retroperitoneal abscess due to a suppurating kidney.

Perinephritic Abscess.—CASE CLVI.—Halle and Bernard (*Revue Chirurg. Presse*, from Manley, *loc. cit.*) record the case of an infant eighteen months old having a mass in the right side diagnosed as encysted peritonitis with atypical appendix. Operation revealed the case to be one of perinephritic abscess.

The writer saw the following hitherto unreported case in substitution for Dr. T. G. Morton, and is indebted to him for permission to report it.

CASE CLVII.—A girl aged sixteen years, by occupation a seamstress, was brought to the Pennsylvania Hospital complaining of pain in the right lower abdominal quadrant, radiating to the back. She had been ill for a week and in bed for four days. The pain was first noticed in the right leg upon sitting down or arising from a sitting posture. Her trouble had been diagnosed as appendicitis, and she was sent to the hospital for operation. There was marked tenderness of the abdomen over McBurney's point, and muscular rigidity and retraction were observed on palpation, also a mass extending from the outer border of the rectus into the right iliac fossa and from McBurney's point downward. The right thigh was slightly flexed and her temperature was 102° F. Her abdomen, flank, and lumbar region posteriorly were examined by bimanual palpation without turning her back to view. When questioned regarding previous trouble in the back she denied its existence. The diagnosis of appendicitis was approved, and she was immediately prepared for operation. Under ether anaesthesia the abdomen was incised and the appendix brought into view. It was very slightly congested and was removed. There was no evidence of other inflammation. Instead of finding a mass in the right iliac fossa, its exploration showed it to be very shallow, and the question was raised of malformation of the ilium or of possible trouble with the spine with resultant iliac abscess. The complete absence of fluctuation, the discovery by the Chief Resident that the interior of the appendix was ulcerated, and so accounted for the symptoms, and the fact that the patient's back had not been sterilized and that she was much shocked, all determined the writer to conclude the operation and leave the investigation of the shallow iliac fossa for another occasion. On removal from the operating-room, the patient's temperature was 96.2° F. Her shock, however, was overcome by heat and stimulation. Her abdominal wound did well, but she was so noisy and restless at night that on the fifth day her general condition gave such anxiety that her abdominal wound was examined. It was found in perfect condition. She was then questioned whether she at that time had, or ever had any deformity of her right hip or of her back, or ever suffered any distress with either. She denied that

her back occasioned her distress. An attempt to pass a fresh binder under her to secure her abdominal dressing was followed by a loud cry. Questioned as to its cause, she created surprise by contradicting her denial of but a moment before, and admitted that she suffered from pain in the back. She was turned upon her side and a large fluctuating mass was found extending over both lumbar regions and midway between the pelvic crest and the scapular inferior spines. A couple of hours later this was freely incised in three places with the aid of a local anæsthetic. Her alarming shock upon her previous anæsthetization, and her grave general condition, prevented a second resort to general anæsthesia. The mass proved to be a very large and foul lumbar abscess, containing much necrotic material. The deep origin of the pus could not be discovered, and the patient's condition forbade exploratory procedure. Her condition was more comfortable on the following day, but on the day after she died. Autopsy was denied, and the diagnosis is debatable. The examination of the urine the day after admission showed a specific gravity of 1030, a slight trace of albumen, a few hyalin casts, some epithelium, and leucocytes. Its examination four days later, upon the day the abscess was opened, discovered no albumen, but hyalin casts, epithelium, and leucocytes were still present. The origin of the abscess was probably either vertebral or perinephritic. The examination of the urine of the first case reported in this paper, one of extensive psoas abscess due to vertebral disease but without deformity, was very similar to the report just read, so that the pathological condition of the urine does not necessarily show that the kidney was primarily in fault. On the other hand, the perfect health of the patient and her activity up to the time of her seizure, suggest that the suppurative process was of rapid formation, and therefore more probably perinephritic than spinal. The unfluctuating character of the thickening felt in the iliac fossa at the time of the abdominal operation may possibly be explained by the displacement into the fossa of the kidney by the collection of pus posterior to it, and so the primary diagnosis of appendicitis in this case is revised to that of perinephritic abscess; and it is the sin of omission in not viewing the patient's back in this case, despite her assertion that it was sound, which inspired this paper.

Renal Calculus.—CASE CLVIII.—A. D. Bevan (*ANNALS OF SURGERY*, 1901, xxxiii, 630) reports the case of a woman who suffered recurrent

attacks attributed to appendicitis. Urinalysis discovered hæmaturia and the X-rays a renal calculus. Dr. Bevan commends the use of the X-rays in effecting differential diagnosis in such cases.

URETER.

Abscess.—CASE CLIX.—Charles McBurney ("International Text-Book of Surgery," Vol. ii, p. 405) says "a purulent cyst of the ureter has led to operation for a diseased appendix, the symptoms of the case, both subjective and objective, simulating those of appendicitis (Guitéras)."

Gonorrhæal Ureteritis.—CASE CLX.—Reynier (*Bull. et Mém. de la Soc. de Chir. de Paris*, 1900, xxvi, p. 169) reports the case of a man suffering from pain in the right iliac fossa and exhibiting a mass there. The diagnosis of appendix led to operate for that trouble. But the appendix was normal, and beneath it was an abscess due to gonorrhæal ureteritis. The primary diagnosis of appendicitis was revised to that of gonorrhæal ureteritis.

Calculus.—CASES CLXI to CLXIII.—Brewer (*ANNALS OF SURGERY*, 1901, xxxiii, 590) and William Russell (*Scottish Medical and Surgical Journal*, 1900, vii, 197) report three cases of primary diagnoses of appendicitis. Two of the cases were Brewer's and underwent three operations apiece. Russell's case was not operated upon, but passed a calculus. All three cases suffered revision of their diagnoses to that of ureteral calculus.

PROSTATE.

Gonorrhæal Prostatitis.—CASE CLXIV.—Brewer (*ANNALS OF SURGERY*, 1901, xxxiii, 600) reports the case of a man of twenty years, who four days previously was attacked with paroxysmal abdominal pain in the right lower quadrant. There was vomiting, but his fæces and condition suggested the existence of general peritonitis. The abdomen was enlarged, tender, hard, and very rigid. Diagnosis was made of general peritonitis due to a perforated appendix. Operation revealed that organ as well as the gall-bladder, kidney, etc., normal, but the lymph glands on the right side were enlarged. A subsequent rectal examination discovered an acute follicular prostatitis preceded by a gonorrhæal discharge of recent existence. The primary diagnosis of appendicitis was revised to that of gonorrhæal prostatitis, with enlargement of the retroperitoneal lymph glands.

Acute Epididymitis.—Howard Lilienthal (*ANNALS OF SURGERY*, 1901, xxxiii, 631) invited attention to the abdominal pain preceding an attack of acute gonorrhæal epididymitis, as a condition that might be mistaken for appendicitis. Such cases may be accompanied by pain and tenderness at McBurney's point.

LIVER.

Subhepatic Abscess.—Weiss (*Rev. Méd. de l'Est.*, 1900, xxxii, 357) reports the case of a boy of sixteen years, who suffered from pain in the right iliac fossa, fever, vomiting, and diarrhœa for eight days. His temperature was subnormal, his pulse weak, and his general condition very bad. His countenance was Hippocratic; there was dulness in the right

mass. A diagnosis was made of appendicitis with general peritonitis. Incision evacuated an abscess that was retrocæcal and subhepatic, and the diagnosis was so revised (condition of appendix not mentioned).

Dahlgren (*Upsala Läkareförenings*, iv, 197; *Centralblatt für Chirurgie*, 1899, 825) reports two cases in which the symptoms pointed to appendicitis, but the diagnosis was limited to abscess in the ileocæcal region. Incision and evacuation of the abscess were followed by a short period of improvement. A cæcal fistula persisted, and operation was again attempted in search for the cause of trouble. Pus was discovered to come from the subphrenic region; death ensuing, post-mortem examination discovered that in one case the appendiceal wound had drained the abscess. No general peritonitis existed, and the appendix was normal.

GALL-BLADDER AND DUCTS.

The following thirty cases were diagnosed as appendicitis. The diagnosis in each case was revised by examination at operation or autopsy to that of some lesion associated with the gall-bladder. These cases are as follows:

Revised Diagnoses, with References.

Dilatation of the Gall-Bladder.—CASE CLXV.—One case, Rotter (*Berliner klinische Wochenschrift*, xxiv, 832).

Rupture of the Gall-Bladder.—CASE CLXVI.—One case, Peabody (*Medical Record*, 1900, lvii, 935).

Cholecystitis.—CASES CLXVII to CLXIX.—Three cases, Janeway (*Medical Record*, 1900, lvii, 897).

Cholecystitis.—CASE CLXX.—One case, Elliot (Chute, in *Boston Medical and Surgical Journal*, 1899, cxl, 236).

Cholecystitis.—CASES CLXXI, CLXXII.—Two cases, Richardson (*American Journal of the Medical Sciences*, 1898, cxv, 629).

Empyema.—CASE CLXXIII.—One case, Taylor (*Virginia Medical Semi-Monthly*, 1898, p. 708).

Empyema.—CASE CLXXIV.—One case, Parmentier and Fossard (Adenot, in *Lyons Médicale*, February 24, 1901).

Empyema.—CASE CLXXV.—One case, Gérard Marchant (*Bull. et Mém. de la Soc. de Chir. de Paris*, April 23, 1897, p. 304).

Empyema.—CASE CLXXVI.—One case, Jacob (*Thèse*, Paris, 1893).

Cholelithiasis.—CASE CLXXVII.—One case, Means (*Journal of the American Medical Association*, 1899, ii, 311).

Cholelithiasis.—CASE CLXXVIII.—One case, Deaver, J. B. (*Journal of the American Medical Association*, 1899, i, 866).

Cholelithiasis and Dropsy.—CASE CLXXIX.—One case, Fowler ("Appendicitis," 1894, p. 123).

Cholelithiasis and Cystitis.—CASE CLXXX.—One case, Mynter ("Appendicitis," 1900, p. 126).

Cholelithiasis and Cystitis.—CASE CLXXXI.—One case, Terrier (*Gazette Hebdomadaire de Méd. et de Chir.*, 1895, xxxii, 603).

Cholelithiasis and Cystitis.—CASE CLXXXII.—One case, Brewer (*ANNALS OF SURGERY*, 1901, xxxiii, 598).

Cholelithiasis and Cystitis.—CASE CLXXXIII.—One case, Reynes (*Rev. de Chir.*, 1900, xxii, 380).

Cholelithiasis and Cystitis.—CASES CLXXXIV to CLXXXVI.—Three cases, Richardson (*American Journal of the Medical Sciences*, 1898, cxv, 629).

Cholelithiasis and Cystitis.—CASE CLXXXVII.—One case, Guinard (Le Dentu and Delbet, vii, 513).

Cholelithiasis and Empyema.—CASE CLXXXVIII.—One case, Fowler ("Appendicitis," 1894, p. 122).

Cholelithiasis and Empyema.—CASE CLXXXIX.—One case, Kilgore (*Philadelphia Medical Journal*, 1900, vi, 1167).

Cholelithiasis and Empyema.—CASE CXC.—One case, Berg (*Medical Record*, 1901, i, 1025).

Cholelithiasis and Empyema.—CASES CXCI, CXCII.—Two cases, Adenot (*Lyons Médicale*, February 24, 1901).

Cholelithiasis, Empyema, and Abscess of Abdominal Wall.—CASE CXCI.—One case, Gibbon (*Philadelphia Medical Journal*, 1901, January 19).

Gall-Stone in and obstructing the Intestines.—CASE CXCI.—One case, Sonnenburg (*Berliner klinische Wochenschrift*, 1897, xxxiv, 810).

It is regrettable that limitations of space prevent the presentation of the interesting details of these cases. An abstract of one case is appended because, in addition to the conditions of cholelithiasis and empyema of the gall-bladder, there were abscess of the abdominal wall, internal and external fistulæ communicating with it, and a history of the diagnosis of the case as one of hernia, prior to its classification as one of appendicitis.

J. H. Gibbon (*Philadelphia Medical Journal*, January 19, 1901) reports the case of a woman, fifty years of age, who suffered for four years severe pain starting low in the right side of the abdomen and radiating to the umbilicus, and occasionally to the right shoulder. There was no history of vomiting, jaundice, collapse from pain, or of the passage of gall-stones. Her last attack was characterized by severe pain accompanied by chill and fever, headache and constipation, but no vomiting or jaundice. Pain was most severe in the right iliac fossa, and the diagnosis of appendicitis was made by her attending physician. The following summer, the patient came under the care of Dr. Stout. She was then wearing a truss to control a mass in the right iliac fossa, supposed by her last consultant to be hernial in character. The skin over the mass was perforated by a sinus discharging pus. Operation by Dr. Gibbon discovered an abscess in the abdominal wall extending in several directions. In one of its pockets was a small sinus; this when dilated led into the gall-

bladder, which contained fifty-one gall-stones a little larger than peas. Diagnosis was revised to cholelithiasis with formation and rupture of an abscess of the abdominal wall.

CONCLUSIONS.

The mass of evidence furnished has been gleaned from the literature of the past four years and its references. No attempt has been made to make the evidence complete in quantity; the aim has been rather to make it illustrative of the *variety* of abscesses occurring in the right iliac fossa, with mention of some other lesions that have not been recognized for what they were, and that have been mistaken for appendicitis.

The question naturally follows: "Is the diagnosis of appendicitis difficult?"

Turning to "Appendicitis" by Dr. G. R. Fowler, 1894, we find that he agrees with Talamon, saying (page 117), "In the average typical case of appendicitis there should be no greater difficulty in making a diagnosis than the physician ordinarily finds in arriving at a conclusion in a case of pneumonia." This book contains twenty excellent pages on diagnosis and differentiation, and is illustrated not only by abstracts of cases of appendicitis that have not been primarily recognized, but also by cases of other lesions that have been mistaken for appendicitis, and to which this paper is indebted.

In Dennis's "Surgery," published in 1896, the article on appendicitis written by Hartley contains no comment on Differential Diagnosis.

In "Surgery by American Authors," the chapter on Appendicitis, written by Richardson and Cobb, says: "The diagnosis of acute appendicitis is rightly regarded as easy," and devotes five lines to enumeration of diseases from which it should be differentiated.

The "American Text-Book of Surgery" (1899) takes the question of diagnosis seriously, devoting half a page to it and a full page to differential diagnosis. The tone of the author suggests that error is possible and care required to avoid it.

In the "International Text-Book of Surgery," 1900, the

article on Appendicitis is written by McBurney, who says: "An attack of appendicitis accompanied by the characteristic symptoms is rarely mistaken for any other condition; but other diseases within the abdomen may present many of the symptoms of appendicitis."

The "Cyclopædia of Practical Medicine and Surgery" (Gould and Pyle), 1900, thus introduces the topic of diagnosis: "Typical cases of appendicitis are frequently easy of diagnosis, but in the large majority of cases an unending variety of symptoms difficult to read or to explain are present." Further on, some earnest lines warn the necessity, in all cases, of only making a diagnosis after a careful review of the history and an exhaustive examination of the existing conditions. A column and a half are devoted to "conditions that may simulate the disease (appendicitis) or create confusion in diagnosis."

In "Appendicitis and its Surgical Treatment," 1900, Herman Mynter, in eighteen pages on diagnosis and differential diagnosis, gives a comprehensive review of the published opinions on these topics, and, like Fowler, quotes cases of appendicitis that were mistaken for other lesions, and *vice versa*. This paper has quoted from the latter class. No general opinion is expressed as to the ease or difficulty of diagnosis. Yet one is impressed on completing these chapters that the author believes that the diagnosis of appendicitis is not usually difficult.

"Appendicitis," by Dr. John B. Deaver, 1900, devotes one-sixth of the book (forty-four pages) to an elaborate and able chapter devoted to consideration of Diagnosis and Differential Diagnosis, and gives perhaps the most complete enumeration of lesions that may be mistaken for appendicitis. One of the cases reported has been quoted in this paper. The chapter on diagnosis opens with the sentence, "The diagnosis of appendicitis is ordinarily unattended with special difficulties."

The opinions of these authorities may be considered representative, and the initial sentence of Dr. Deaver descriptive of present opinion.

It is because "the diagnosis of appendicitis is *ordinarily* unattended with special difficulty" that the possibility of other lesions occurring in the right iliac fossa is not sufficiently borne in mind. If the variety or quantity of evidence furnished by this paper is not sufficient to carry conviction, it can be increased by referring to the illustrative cases accompanying Dr. Deaver's excellent chapter on Differentiation; it is written from the point of view that other lesions may be erroneously diagnosed in place of appendicitis, and it well establishes that fact. And so from both points of view, that of mistaking appendicitis for other lesions and that of mistaking other lesions for appendicitis, the conclusion is reached that *a diagnosis in cases with symptoms pointing to the right iliac fossa should not be made without a routine, conscientious examination for, and exclusion of, the various troubles that may exhibit misleading symptoms and signs.*

It was only fifteen years ago (April 23, 1887) that a member of this Academy, Dr. Thomas George Morton, performed the first appendicectomy for a previously diagnosed appendicitis.

The intervening years have developed a keen and necessary apprehension of the danger of this disease and of the necessity of meeting it by early diagnosis and prompt operation, and this paper must not be misunderstood as detracting from these dangers and necessities.

Zeal for a cause, however good, may lead to the disregard of claims equally just. The other ills of the iliac fossa have their claims as well as those of the appendix, and an opinion on the plainest case of trouble in this region should only be reached after careful Differential Diagnosis, and the question of Differential Diagnosis is omitted, with the hope that it will be honored in discussion.

The author desires again to express his earnest thanks to the gentlemen who so kindly contributed their cases to the paper, and to Dr. Cross, from whose notes two of the author's cases were reported.

SARCOMA OF THE MESENTERY.

RESECTION OF ONE HUNDRED AND NINETEEN INCHES OF SMALL
INTESTINE; RECOVERY.¹

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PRIMARY tumors of the mesentery are rare, and therefore it seems justifiable to give the history and surgical treatment of a case which, besides the extirpation of the tumor, necessitated the removal of a very long portion of the small intestine.

Primary mesenteric tumors, in comparison with other abdominal tumors, are seldom met with. According to their pathological structure, they may be divided into:

(1) Lipomata.

(2) Cystic tumors: (*a*) Lymphcysts; (*b*) Chylecysts; (*c*) Cysts containing cholesterin and oil, which are a form of dermoid cysts.

(3) Fibromata.

(4) Mixed tumors, of which I will mention: (*a*) Varieties of lipoma: (Fibrolipoma, Myxolipoma, Angiolipoma). (*b*) Myxosarcoma; (*c*) Fibrosarcoma.

(5) Malignant tumors: (*a*) Sarcomata; (*b*) Carcinomata.

(6) Tubercular tumors found in the form of the conglomerated tubercle.

Patient is Mr. J. J. M., aged thirty years, born in England. He is a sober man of regular habits, an electrician by trade, which

¹ Read before the Chicago Surgical Society, February 3, 1902.

trade he has followed for nearly twenty years. His family history is good, no history of cancer or tuberculosis in any near relatives. His mother died at fifty-two, cause unknown; father died before the birth of our patient from a wound received in the army in India. One brother was lost by drowning and two sisters died in infancy. Patient is married and is father of one child, which seems in good health. Has been the subject of gastric disturbances all his life. Does not know that he has had any diseases of childhood and has had no venereal diseases. Had abscesses in the axillary glands six years ago, none in groin.

Present trouble began about four months ago. His best or highest weight was 177 pounds, but thinks his normal weight is about 165 pounds. Weight on December 1 was 117 pounds. Says he has lost fifteen or twenty pounds in last two weeks. Has always had a good appetite, but for the past two weeks, the eating of even a very small amount has caused excruciating pain, which would cease after vomiting. Severe headaches, frontal and occipital, accompanied the pain in belly. A bearing-down pain in the abdomen around the umbilicus has been present irregularly day and night for the past two months. Has had one or two stools daily of firm consistence. Was treated by several physicians for indigestion. Was sent to my office after his physician had discovered a tumor in his abdomen on November 23.

Physical examination of the patient showed an absence of adipose tissue under the skin, but a fine muscular development, and patient says he has always been an amateur athlete. Heart and lungs normal. Urine normal, pulse 68, temperature 98° F.

An examination of his abdomen revealed the presence of a flat, round tumor the size of a saucer and having the shape of two saucers placed with their edges together, a lens-shaped tumor, which was freely movable in all directions around the umbilicus, but which seemed to be limited in its movements by a band or by adhesions on its under surface. Unless very forcible, movement of the tumor in any direction was painless. The abdominal parietes were so thin that the surface irregularities could easily be made out, and some small lumps which were thought to be glands were felt in the periphery of the tumor.

I believed the tumor to be either omental or mesenteric, and recommended that the patient go to the Lutheran Hospital for preparation and operation. The patient entered the hospital on

November 29, and was kept under careful surveillance until December 3, the day of the operation. During the week previous to the operation the patient was given frequent hot baths, was freely purged, and kept on highly nutritious liquid diet, and was in fine shape for the operation, which I feared would be a difficult one, although never suspecting that I would have to excise nearly one-half of the small intestine.

Operation.—Patient was anæsthetized by the use of chloroform, and proved to be an easily controlled subject, requiring very little of the anæsthetic, the median incision extending from just above the umbilicus to the symphysis.

There was only a thin myxœdematous omentum, and this being pushed upward the tumor of the mesentery was found lying in the median line, its centre just above the promontory. The lens-shaped tumor was freely movable and not adherent at any point. Placing my left hand under it I lifted it out of the abdomen, and with it came the loops of small intestine. The tumor was covered on both surfaces by smooth, glistening peritoneum, and the loops of intestine formed a wreath of convolutions around the tumor. Fig. 2 is a diagrammatic sagittal section.

It was apparent at once that to remove the tumor alone would mean gangrene of all the intestines attached to its periphery, because all the blood-vessels and lymphatics running to and from the intestines passed through the mass of the tumor. The superior mesenteric artery entered the tumor at its upper edge, and most of its branches were involved in the solid tumor. I therefore proceeded to extirpate the mesenteric tumor together with the small intestines attached to its periphery. I used long clamps to compress the afferent loop of gut and the distal or efferent loop. They were so applied that their points stood at right angles to each other, the two intestines being compressed by that part of the long clamps nearest the locks. These two clamps left about two inches of the root of the mesentery between them. (Fig. 1.) In this part of the mesentery just in front of the aorta, I could see and feel the pulsation of the superior mesenteric artery. The first and largest branches of this vessel with the mesentery were grasped by large hæmostatic-pressure forceps and ligated with celluloid linen yarn and then cut off. After this was done, the mesentery and the two guts were cut off close to the compressing clamps and the whole specimen removed. All bleeding points

were ligated, and the mesentery was stitched together by a running suture beginning just in front of the aorta and extending to the intestines. An end-to-end anastomosis was next made by means of ordinary interrupted stitches, making as many knots as possible on the inside. The last third, however, was closed

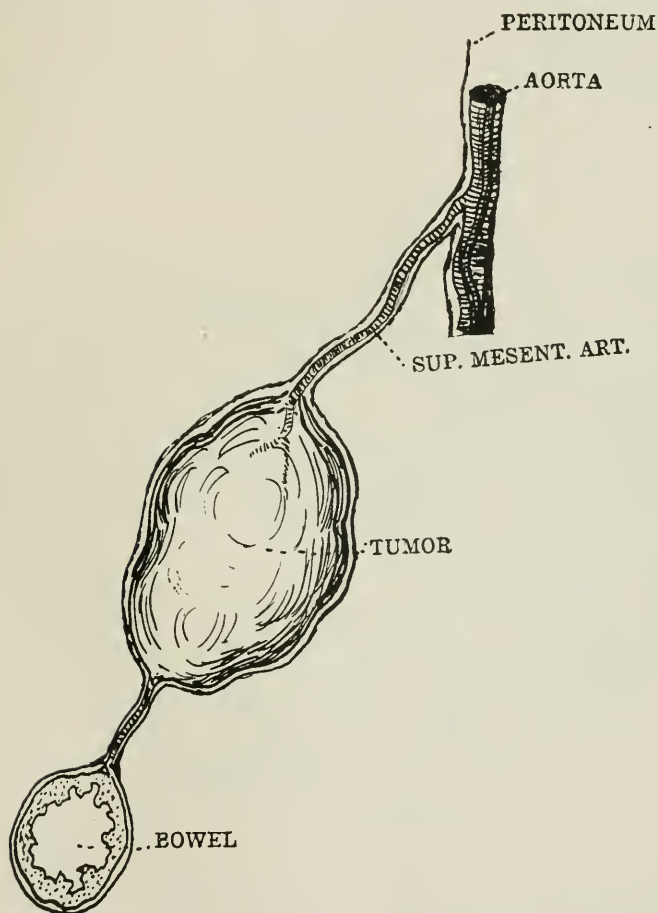


FIG. 1.

by means of the Czerny-Lembert suture. The abdominal cavity was filled with warm saline solution and the incision closed by numerous through and through interrupted stitches. I will not present the notes of the progress of the case, but will simply state that from a technical and surgical stand-point the recovery was

rapid and free from febrile or suppurative disturbances of any kind. Of course, his diet was restricted at first, and nutrient enemata were used to some extent. Calomel was given on the fourth day and followed by Epsom salts with satisfactory results. After that time he was nourished by the mouth exclusively, and his colon left to perform its normal functions. The diet consisted of milk and soup and a preparation of beef juice. The amount of the small intestine removed involved all of the ileum except

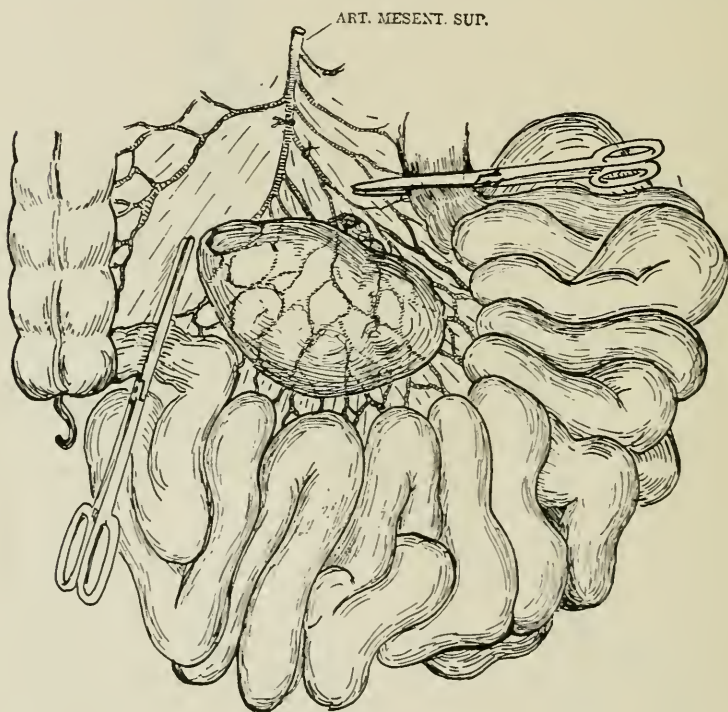


FIG. 2.

three or four inches, which were left attached to the ileocaecal valve and a part of the jejunum, the whole length of small intestine removed being 119 inches. This is more than one-third, perhaps half of the small intestine, and still my patient, who weighed 117 pounds when placed on the operating table and about 112 when he came away from it, gained flesh so rapidly that he weighed 124 pounds forty days after the operation, being

able to walk about and take long rides from his residence to my rooms whenever I wished to see him.

The specimen was examined microscopically by Drs. Evans, of Chicago, Gradwohl and Tiedeman, of St. Louis, each of whom made sections of the tumor and found it to be a small round-cell sarcoma. During the operation only a few small glands were found enlarged in the vicinity of the tumor, all of which I removed.

The patient left the hospital on the twenty-third day, and enjoyed good health excepting an occasional headache. His appetite and digestion were normal, as were his intestinal discharges.

TABLE OF THIRTY-SIX CASES OF RESECTION OF THE SMALL INTESTINE
COLLECTED FROM SURGICAL LITERATURE.

(1) Hahn: Eighty centimetres (thirty-two inches) ileum; twenty centimetres (eight inches) colon. Male, thirty-eight years; recovery, without disturbance of nutrition.

(2) Canthorn (*New York Medical Journal*, 1895): Resected 109 centimetres (forty-three inches) of small intestine from a man aged forty-nine years, for sarcoma of the mesentery, ends united by Murphy's button. Patient recovered from operation, but died four months later from obstruction brought about by Murphy's button.

(3) Budberg-Boeninghausen and W. Koch: Male, aged sixty-eight years, very robust, 110 centimetres (forty-three and a half inches) flexure; death on third day from peritonitis, which existed at time of operation.

(4) Budberg-Boeninghausen and W. Koch: Male, thirty-three years, 110 centimetres (forty-three and a half inches) ileum; for gangrene after incarceration, femoral hernia; recovery.

(5) Trombetta in 1884 resected 110 centimetres (forty-three and a half inches) of small intestine in a woman aged forty years. Recovery (quoted by Ruggi).

(6) Budberg-Boeninghausen and Koch: Male, forty-two years, 112 centimetres (forty-four inches) flexure; gangrene after twisting; recovery.

(7) Marston resected 112 centimetres (forty-four inches) for sarcoma of mesentery. Death five months afterwards from perforation due to Murphy's button.

(8) Billroth: Female, fifty-two years, 113 centimetres (forty-five inches) small intestine, on account of fixation by the extirpation of a fibroma size of child's head. Death from collapse.

(9) Troje: 115 centimetres (forty-six inches), female, twenty-five years, for four ring-like tuberculous strictures. Result, fistula.

(10) Elliot (*ANNALS OF SURGERY*, January, 1895) resected 124 centimetres (four feet three-quarters inch) in a man aged twenty-five years,

for infarction due to thrombosis of the superior mesenteric veins. Patient was in good health two years after.

(11) Roux (*Semaine Médicale*, 1892) resected 124 centimetres (four feet three-quarters inch) of intestines for a lipoma; recovery.

(12) Budberg-Boeninghausen and Koch: 125 centimetres (four feet one inch) flexure. Death from already existing peritonitis on the same day.

(13) Budberg-Boeninghausen and Koch: 125 centimetres (four feet one inch) ileum, death on day of operation from already existing peritonitis.

(14) Obalinski: 126 centimetres (four feet two inches) ileum, for gangrene. Death in twenty-four hours.

(15) Studsgard: 128 centimetres (four feet three inches) jejunum for invagination. Death five days after peritonitis.

(16) Schlange: 135 centimetres (four feet six inches) ileum, gangrene. Recovery without disturbance.

(17) Braun: 137 centimetres (four feet seven inches) small intestine, on account of circumscribed peritonitis. The woman recovered in the beginning, but soon the appetite began to fail and the wasting continued to increase; œdema of the lower extremities set in, and four months after the operation death took place. Post-mortem report: shrinking of kidney, but otherwise nothing abnormal.

(18) Kosinski: 143 centimetres (four feet nine inches) ileum, gangrene from hernia. Death from collapse.

(19) Müller: Twelve-year-old boy; 150 centimetres (five feet) ileum and cæcum, and colon for invagination; for seven days normal, then rise of temperature and pulse rate, vomiting, diarrhœa, death. Cause of death, according to Professor Ziegler's view, filling of the intestine with air and fluid.

(20) Kocher: 160 centimetres (five feet four inches) ileum, gangrene. Recovery without disturbance.

(21) Budberg-Boeninghausen and Koch: 175 centimetres (five feet ten inches) ileum, cæcum with appendix and ascending colon, artificial anus formed, closed two and a half months after operation. Recovery without disturbance.

(22) Wullstein: 175 centimetres (five feet ten inches) ileum for strangulation. Recovery without disturbance.

(23) Schwalbach: 183 centimetres (six feet one inch) ileum; recovery.

(24) Hinterstoisser: 186 centimetres (six feet two inches) ileum and part of jejunum for incarceration. Recovery without disturbance.

(25) Schlatter resected 192 centimetres (six feet four inches) of ileum for gangrene due to the intestine protruded through an abdominal wound being grasped tightly by the skin. Recovery from the operation was uneventful save for an attack of urticaria which appeared on the fifth day, disappearing on the tenth. This was probably owing to the interference with the assimilatory area due to the operation. His weight increased in the second month after the operation from 140 to 165 pounds.

He was then (two months after the operation) feeling perfectly well, there being no tendency to diarrhœa. An examination of his ingesta and ejecta for ten consecutive days showed, however, that his appetite was abnormally great; that whereas the amount of undigested albuminous material in the fæces was slightly above the normal percentage, the amount of fat similarly lost was very much more than normal. The subsequent history showed that the man was not fit for heavy work, and that he required much more nutritious food than the working-people of his own class doing their full work. Other food caused abdominal pains. According to a late letter to A. Albu, patient afterwards recovered and became completely normal.

(26) Koeberle: 205 centimetres (six feet ten inches) small intestine for four strictures, artificial anus, closed after six weeks. Recovery without disturbance.

(27) Kocher: 208 centimetres (six feet eleven inches) for tearing of small intestine. Recovery, but subject to diarrhœa if not very careful of diet.

(28) Dreesmann: 215 centimetres (seven feet two inches) ileum for gangrene. Recovery, but slight diarrhœa kept up.

(29) Shepherd: Man, aged twenty-eight years, 234 centimetres (seven feet nine inches) ileum. After operation thin stools, but increased forty pounds in weight.

(30) Hayes resected 255 centimetres (eight feet four and a half inches) ileum for laceration of mesentery with crush of intestine in a boy aged ten years. During recovery there was a great tendency to diarrhœa, which lasted for eight weeks. At a later period a tendency to diarrhœa recurred. There was also occasional vomiting, and the patient suffered from chorea.

(31) Fantino: In a woman, aged sixty-one years, 310 centimetres (ten feet four inches) ileum, for gangrene from incarceration, healing by first intention. The further study of the nutrition in the intestinal canal showed that the same was not complete. Substances introduced appeared rapidly in the stools, which were not digested.

(32) Ruggi: Boy, aged eight years, 330 centimetres (eleven feet) small intestine for circumscribed peritonitis. Recovery and good health one year after.

(33) Obalinski: 365 centimetres (twelve feet two inches), practically the whole. Death in twenty-two hours.

(34) Monprofit: 310 centimetres (*Berliner klinische Wochenschrift*, 1899, No. 16).

(35) Lexer: resected 200 centimetres ileum; complete recovery (*Berliner klinische Wochenschrift*, 1900, No. 1).

(36) Bernays: resected 298 centimetres (nine feet eleven inches) ileum and jejunum, together with a mesenteric sarcoma. Patient made a perfect recovery, and was rapidly gaining weight forty days after the operation. Reported in the present publication. The above table is made only with reference to length of intestines removed and is not a table of

mesenteric tumors, of which there are more than three hundred in literature.

From the above table it will be seen that the literature of surgery contains thirty-six cases which we may utilize for the study of the question confronting us in the treatment of cases requiring the resections of long pieces of the small intestine. The question of exactly how much of the small intestine can be removed without detriment to the nutrition of the body must be answered for the human being by the surgeon. At present the number of cases is small, and therefore statistics are not reliable. Experimental researches have been made by several surgeons and physiologists on dogs.

Nicholas Senn, in his "Experimental Researches on Intestinal Surgery," published in 1890, concludes that one-third of the length of the small intestine is about the degree of tolerance in dogs, and that resection of more than one-third will be followed by marasmus, which will eventually prove fatal. He found in experiments made on seven cats and dogs, of whom two survived long enough, that a compensatory hypertrophy of the wall of the intestine was gradually developed.

Trzebitzky (Langenbeck's *Archives of Surgery*, Vol. xlviii, 1894), basing his conclusions on twenty-eight extensive resections of the small intestines in animals, finds that resections of half of the small intestines were quite well tolerated. Resections of two-thirds made such an inroad on the chemical and mechanical processes of digestion that prolongation of life became impossible. There was incessant diarrhœa, followed later on by vomiting, food passed off undigested, and in spite of a craving appetite the animals perished of inanition. Trzebitzky also observed that resections of the jejunum were more serious than resections of the ileum in animals. He declares that resections of one-half of the length of the small intestine in man will be quite permissible, provided that it is the distal half, and that no other complications are present.

Monari (*Beiträge zur klinischen Chirurgie*, Vol. xvi, 1896) goes even a step farther, and believes that he has proven by his experiments on dogs that seven-eighths of the intestine can be removed without the production of important interference with

metabolism and nutrition. For my part, I am inclined to think that Senn is nearer the truth than Monari, but Trzebitzky has done the largest number of animal experiments, and is perhaps right in saying that one-half of the small intestine may be safely removed. In my own case about one-half was removed, I think. The exact length of the small intestine in a given person is difficult to determine before death, and even at the autopsy will vary according to the conditions which the cadaver has been subjected to. The extremes of length in Treves's investigation were fifteen feet six inches and thirty-one feet ten inches; thus the average length of small intestine according to his measurements was twenty-one feet ten inches, which equals 262 inches, or 655 centimetres. Gegenbaur, of Heidelberg, gives the length as ranging from 550 to 650 centimetres. Hollstein found it to vary between 416 and 864 centimetres. Cruveilhier found the shortest intestines to be 234 centimetres and 256 centimetres in two cadavers, whilst the longest I can find on record was found to be 1088 centimetres by M. J. Weber. The great anatomist Jacob Henle found the length of the small intestine, not counting the duodenum, to vary immensely.

After all that has been said, it seems to me that the amount removed from a patient is not near so important as the length which is left. However true this paradoxical statement, it is of little practical value because the surgeon in a given case is confronted with a problem and a condition which he must then and there meet. The patient is in imminent danger of death, and the surgeon must act, and must remove gangrenous or diseased gut in toto, and cannot figure on the length of intestine that must be removed until after the patient has been put to bed and placed in a condition most favorable for his recovery.

Turning now to the clinical experience which we have before us in the thirty-six cases of our table including my own, we find that death occurred quickly in ten cases. Four survived four months, twenty-two cases recovered permanently, and in two of these the colon was partially removed, and therefore we would expect no ill effects in these two cases. All the

others except three, one of which is my own, report that only ileum was removed. It appears thus that the clinical experience of the thirty-six cases is applicable mainly to the operative results of resection of the ileum.

Taking the arbitrary length of gut resected at 200 centimetres, and using only those cases which reach or exceed this length, we find eleven cases recorded. Two hundred centimetres are approximately one-third the length of the small intestine. Of these only the case of Obalinsky, who removed 365 centimetres, died immediately after the operation. Of the others only five seem to have permanently recovered, not counting my case, which was done only sixty-one days ago.

Accurate investigations by competent physiological chemists as to the metabolic processes in these cases of removal of large parts of small intestine have been made only in three instances. Professor Riva Rocci, in the case of Fantino (see table), and Professor Plaut, in Schlatter's case, undertook the time-consuming researches in 1896. Riva Rocci, in the case of Fantino, where over ten feet of intestine were removed, found a daily loss of 29 per cent. nitrogen and 23 per cent. of fatty substances in the *faeces*. Plaut, in Schlatter's case, in which only six and one-half feet of the intestine were removed, found a loss per day of 10.5 per cent. of nitrogen and 14 per cent. of fat in the *faeces* while the patient was consuming more than normal quantities of food. Docent A. Albu, of the Berlin University, is the third investigator along this line, and his subject was the patient of Lexer, No. 35 of our table. Lexer had removed a mesenteric fibroma and over seven feet of the ileum from this patient in November, 1899, and Albu made his investigations two years afterwards. They are recorded in the *Berliner klinische Wochenschrift* of December, 1901. Exact data are given, and the result of the investigation is that only 10 per cent. of the nitrogen consumed in the food were lost in the *faeces* and only 10 per cent. of the fats were similarly wasted. These figures are almost exactly those of the normal individual in health. Hence Albu claims that his analysis positively proves beyond a doubt that the removal of one-third of

the length of the small intestine can be safely done. The removal of more than one-third he thinks cannot be done without endangering the nutrition of the body.

My case will furnish the subject of another similar investigation, should he be spared a return of the sarcoma. His general condition is excellent. Pulse, 66; temperature, 97.8° F., and there has been a regular gain in weight since the operation. The resected intestine contained a Meckel's diverticulum.

Since the above was written, the patient's health has been impaired by attacks of severe headache and occasional vomiting spells, which I attribute to overfeeding, and which pass away after the administration of a saline purgative.

HÆMOSTASIS OF THE BROAD LIGAMENT.¹

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OF CHICAGO,

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THE almost universal employment of the absorbable ligature in surgery of the broad ligament is in itself a confession of the imperfection of our present methods, a protest against the retention of the foreign body in peritoneal wounds, an admission that the less ligature material we use the better. A glance back over the last few decades gives an impressive showing of efforts to do away with it altogether, and while no instrument or appliance has yet been offered upon which we can rely in all circumstances, the *écraseur*, thermocautery, torsion, retention forceps, electrothermic forceps, and the angiotribe mark the several stages of progression towards the ideal hæmostasis. This should insure: 1. Absolute security against hæmorrhage, primary or secondary. 2. Protection against septic contamination. 3. The minimum of injury to the parts treated. 4. Absence of foreign bodies from the wound.

By the use of the electrothermic forceps and the angiotribe we can approach very nearly these ideal conditions, but there are some objections which render both impracticable for general use. The former can only be used where there is an electric apparatus at hand, and is thus seldom available except in hospital service.

The latter instrument is made after too many models, is often imperfectly constructed, so that it fails in some vital par-

¹ Read before the Chicago Surgical Society, February 3, 1902.

ticular, or it is carelessly used, so that it has not given time for uniformly satisfactory results.

My own experience with the angiotribe has been most gratifying. In several scores of cases, embracing all varieties of work, I have never had a secondary hæmorrhage. I have, however, used it with discretion, and in special cases fortified my stumps with an individual catgut ligature, encircling the ovarian or uterine artery in its course along the broad ligament. The advantages of this procedure are apparent when we consider what are the objections to the usual methods of ligation.

In ligation *en masse* there is the danger of loosening and slipping of the ligature from shrinkage of the stump; the larger vessels may retract and bleed into the cellular tissue, producing hæmatoma, of which Tait once tabulated eighty cases; tissue necrosis and the formation of granulating surfaces may give rise to troublesome adhesions; the absorption into the circulation of the waste products of necrosis or saprophitic germs puts an added burden upon nature's resources and retards convalescence; the drawing upon neighboring structures may cause displacement of organs and more or less constant distress or pain; again, this method necessitates the employment of large sized catgut with correspondingly large knots.

The objections to individual ligation, on the other hand, are greater danger of secondary hæmorrhage; oozing from the stump; the necessity of the running catgut suture to approximate raw surfaces; too much ligature and suture material left in the wound.

Of the two methods, individual ligation is the better; but few of us feel safe in tying with catgut the terminal end of a large pulsating vessel and then closing the abdominal wound.

The method which I employ aims to do away with the objections and unite the advantages of the others. The Newman pressure clamp is applied in the usual manner, if for exci-

sion of the appendages of tumors with pedicle, along the roof of the broad ligament, or directly across the pedicle.

In the former case the bite of the clamp includes the ovarian artery, and by turning the closed instrument half-way on the side the artery can readily be seen and encircled by a small catgut ligature just beneath the clamp and on the proximal side of the broad ligament. The main artery is in this way secured, and in the most advantageous way possible; individually and before it emerges from its moorings in the tissues, thus preventing all thought of slipping from the grasp of the ligature. The clamp is removed and the neat, linear stump receives no further treatment unless it be septic, as in the case of pus-tubes, when I am accustomed to apply 95 per cent. carbolic acid to the entire cut surface at the site of amputation, and resect the interstitial portion of the tube, closing the wound in the usual manner with catgut.

If by reason of anatomical anomaly or enlargement of the collateral branches a second ligature is necessary, it is applied after or before the removal of the clamp, but always in its course in the substance of the tissue and often in the parchment-like clamped portion.

In hysterectomy both the uterine and ovarian arteries are clamped off and tied in precisely the same manner.

Used in this way there can be no slipping of the ligature, or contracting and withdrawing of the artery from the stump. The advantages claimed for this method are:

(1) Complete and permanent hæmostasis, with no possibility of the ligature slipping either off the end of the artery or of the stump.

(2) Inability of the artery to contract and draw away from the grasp of the ligature and form hæmatoma or hæmatocele.

(3) By the combined use of the angiotribe and ligature multiple thrombi are formed, plugging the vessels most securely.

(4) There is no puckering up or massing together of

broad ligament tissue to draw upon or displace other organs or structures.

(5) No strangulated stump tissue remains to slough, granulate, and form adhesions.

(6) The amount of foreign matter left in the wound is reduced to a minimum.

(7) The rapidity of this method and its bloodlessness materially lessen the danger of postoperative shock.

(8) Convalescence is eased materially and hastened to a marked degree.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, February 26, 1902.

The President, L. W. HOTCHKISS, M.D., in the Chair.

HYPERPLASTIC TUBERCULOSIS OF LOWER END OF ILEUM, WITH SCATTERED MILIARY TUBER- CLES ON THE PERITONEUM; RESECTION OF LOWER PART OF ILEUM; IMPLANTATION OF FREE END INTO ASCENDING COLON; RE- COVERY.

DR. C. N. DOWD presented a patient, a well-nourished woman of twenty-five years, with a good family history. She had always been in good health until two years ago, when she began to have attacks of pain in the right iliac region. These attacks lasted from two to twenty-four hours and were severe, but never kept her in bed more than a few hours. There was no vomiting, no noticeable fever, and no diarrhoea. About a year ago the symptoms were so suggestive of appendicitis that she was sent to a hospital for observation; they quickly subsided, however, and no operation was done. The attacks, however, returned, and made it difficult for her to continue her work as waitress, and on January 17, 1902, she was admitted to the General Memorial Hospital. Nothing abnormal could be found excepting a small, slightly tender nodule in the right iliac region, with a sense of resistance in the muscles about it. Temperature, pulse, and respirations normal. Soon after coming to the hospital she had a severe attack of pain in the left inguinal region which lasted several days.

Operation, January 27. A thickened tubercular area about one and a quarter by one inch in extent was found at the lower end of the ileum, three-quarters of an inch from the cæcum. (See illustration.) There were also a few miliary tubercles on the



FIG. 1.—Hyperplastic tuberculosis of ileum. A. Large nodule. B. Small tubercles.

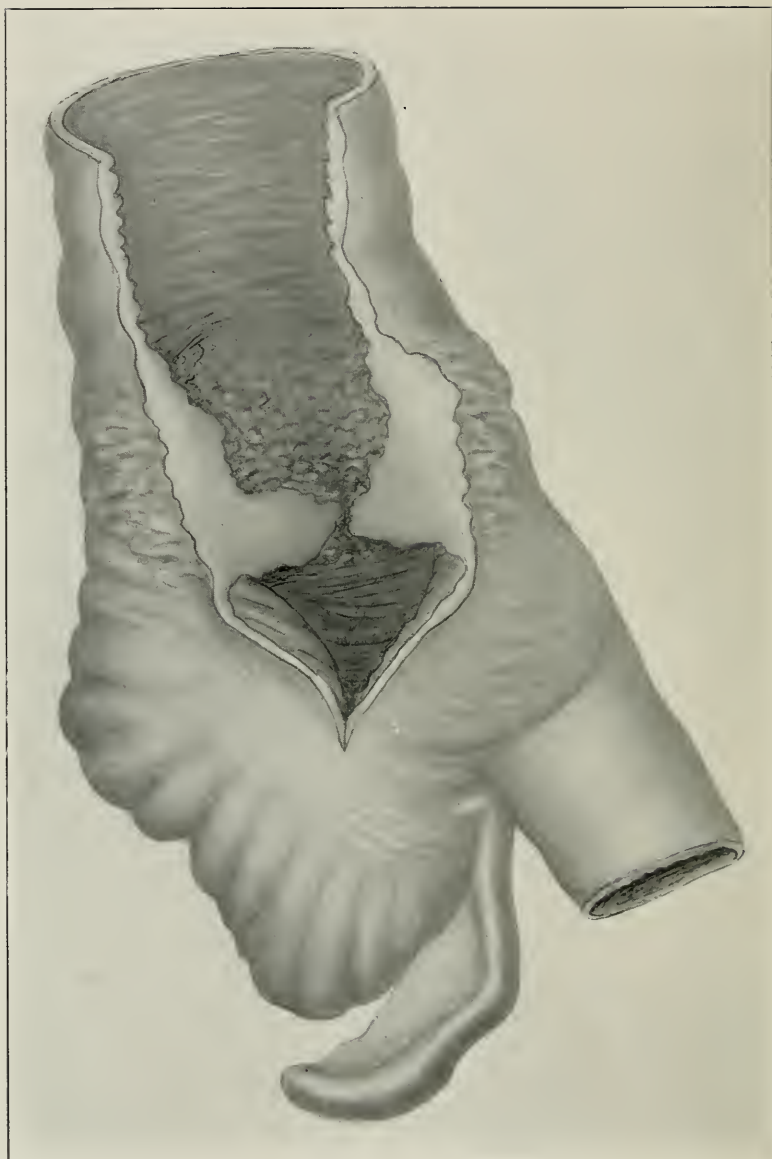


FIG. 2.—Carcinoma of cecum and ascending colon.

intestine near by, and in the left inguinal region there were intestinal adhesions but no visible tubercles. The lower six inches of the ileum were resected, the opening in the cæcum was closed with a double row of stitches, and the free end of the ileum was implanted into a new opening in the side of the ascending colon with the aid of a Murphy button. Recovery without incident, excepting a moderate amount of abdominal pain.

The pathological examination was made by Dr. Cyrus W. Field. There was an ulcer in the mucous membrane under the large nodule. The submucous layer was moderately thickened by an increased connective-tissue formation. No distinct tubercles were found, but three tubercle bacilli were found after an extended search. The main interest in the case centres about this pathological condition. The large nodule was apparently the first lesion which occurred in the abdomen; the few miliary tubercles appear to have been secondary to it, and their location indicates the probability that the infection was carried in the preperitoneal cavity.

There is an extensive literature upon tuberculosis of the intestine in the ileocæcal region; the inflammation has usually been below instead of above the ileocæcal valve. The form of tuberculosis has often been peculiar,—hyperplastic,—characterized by an increase of tissue instead of a loss of tissue.

Crowder (*American Journal of the Medical Sciences*, cxix, 1900, p. 668) has figured a case in which the new tissue fills the lumen of the bowel: it looks like an annular cancer. He has also given an excellent *résumé* of the literature of the subject, from which Dr. Dowd gives some extracts.

Eisenhardt found intestinal tuberculosis present in $56\frac{7}{10}$ per cent. of 1000 tuberculous subjects. In only one instance in these 567 subjects was it supposed to be primary in the intestine, and there was doubt about that. In all but four subjects it was secondary to tuberculosis in the lungs.

Frerichs found but one case primary among 208 of intestinal tuberculosis.

Herxheimer found that in fifty-eight cases of phthisis examined from April to November only one case was free from tubercular lesions in the intestine.

The cæcum is the most common site of the inflammation. Fenwick and Dodwell found it inflamed in 85 per cent. of the

cases which they studied. The swallowing of the sputum is believed to be the source of infection, and the stasis of the intestinal contents and the abundance of lymphatics the causes of this localization.

The form of intestinal tuberculosis which is interesting surgically is the hyperplastic form. This is *slow* in its progress; shows an *increase* of tissue instead of a loss of tissue; shows a tendency to remain localized instead of spreading rapidly to other tissues, and shows few tubercle bacilli. It is essentially a slow inflammation of slight intensity, and has been found usually associated with a very slow, or a healing, or a healed tuberculosis in the lungs. These cases, of course, offer the best prognosis for the surgeon.

Conrath (*Centralblatt für Chirurgie*, 1898, p. 744) gives us valuable information concerning the results of operation for cæcum tuberculosis. Among eighty-seven cases there were fifty-eight extirpations, with eleven deaths; six resections of the intestinal wall, with no deaths; ten entero-anastomoses, no deaths; but, of course, the disease still remained; eight enucleations, with two deaths; four exploratory laparotomies, no deaths.

He advises extirpation when it is possible. In most instances the symptoms diminished or disappeared after the operation.

ANNULAR CARCINOMA OF CÆCUM AND COLON; EXCISION; LATERAL IMPLANTATION OF END OF ILEUM INTO ASCENDING COLON; RE- COVERY.

DR. C. N. DOWD presented a patient, a woman of twenty-seven years, who was in good health until about a year ago, when she began to have attacks of cramp-like pain in the right iliac region. These increased in severity and frequency until she was incapacitated for her household duties. She came under his care at the General Memorial Hospital, September 19, having had on the previous evening a chill followed by fever, and presenting an indurated tender mass in the right iliac region. Temperature 102° F.; pulse, 104; respiration, 24. Operation was done at once. A mass of exudate was found about the cæcum. This was soft, contained broken-down tissue, a little pus, and looked like the condition caused by a slowly progressing appendicitis. This

was removed as well as possible; a portion was taken for microscopical examination, and the wound was packed. Healing took place in due time, but she suffered from symptoms of intestinal obstruction.

Another operation was done December 6, Dr. B. Farquhar Curtis giving counsel and assisting. An annular, medullary carcinoma was found constricting the colon just above the ileocæcal opening. The cæcum and part of the ascending colon were excised; the end of the colon was closed with silk stitches, and the end of the ileum was fastened into a new opening in the side of the ascending colon with the aid of a Murphy button. The patient recovered promptly, left the hospital in twenty-three days, and is now apparently in good health. (See illustration.)

This report is made for the purpose of advocating the method of operation which was used both in this case and in the case of intestinal tuberculosis just reported, viz., lateral implantation of the free end of the ileum in the ascending colon. In both instances the opening in the large intestine was closed by silk sutures. One part of a Murphy button was inserted in a new opening in the most accessible part of the ascending colon, the other part was inserted in the free end of the ileum, and the two parts were then joined. The colon is so little movable that it cannot be raised so as to make an end-to-end union with ease. It is much easier to close the opening completely, and then to make a new opening above it, where the intestine is easily reached. In this new opening there are no ends or edges which are difficult to adjust, and the union can be firmly made with the minimum expenditure of time and effort. In many places suture is to be preferred to the Murphy button; but this seems to be a location particularly adapted to the use of the button. A very even and firm apposition can be easily made. The button must drop into the large intestine, where its presence produces the minimum disturbance. The resulting opening closely resembles the normal one.

An extensive list of operations for cancer of the cæcum has been published by Cumston and Vanderveer in the *ANNALS OF SURGERY* for January and February of this year. In reading this over, the speaker was surprised to see how little the lateral implantation method had been used in these cases. A study of the recorded results, however, is most instructive, and indicates that the method is much safer than those which have been

most used. In forty-five instances the end of the ileum was fitted into the end of the colon. There were twenty-two deaths, a mortality of 49 per cent. In fifteen instances artificial anastomoses were made, with a mortality of 40 per cent. Many of the patients who did not die from the operation being left in a most uncomfortable condition. In five cases lateral implantation was done. Among these there was one death. In this instance the union was made by suture, the growth was so extensive as to also involve the sigmoid flexure and the bladder.

To this list may be added the cases here reported. Since the point which Dr. Dowd especially advocates is the closure of the open end of the colon and the making of a new opening in its side, we may also add addendum Cases II and XVIII, in which the Murphy button was put in the side of the ileum instead of in its end, and a similar successful case reported by Coley (*ANNALS OF SURGERY*, February, 1900, p. 246). This makes nine cases in which the end of the colon was closed and a new opening made in its side, with one death,—a mortality of 11 per cent.

This, when compared with the 49 per cent. mortality from endeavoring to fit the end of the ileum into the much larger end of the colon, argues very strongly for the method of lateral implantation.

In addition to these sixty-seven cases, Cumston and Vanderveer refer to one case of lateral enterorrhaphy, one case of ileocolostomy (Murphy button), five cases of entero-anastomosis with Senn's plates or Murphy buttons.

In this list there was one death, a mortality of 14 per cent.; not very different from that above given. They are not counted with the others, however, as the site of the junction is not given. There are also four cases in which the result is not given, and seven of exploratory laparotomy or undescribed operations,—a total of eighty-five cases.

DR. A. J. MCCOSH said that quite a number of cases have been reported of what Dr. Dowd referred to as the hyperplastic form of tuberculosis of the intestine, and in the majority of them the pathologists had found it very difficult to determine the exact nature of the tumor, the tubercular structure being very indistinct. Hartmann and others have reported such cases. About a year ago, the speaker said, he had a somewhat similar case, where a tumor could be felt indistinctly through the abdominal wall.

The patient was a woman, about forty years old, who had been complaining for about a year of very severe colicky pain, rather indefinite in character. The abdomen was opened, and a hard, nodular tumor, involving the lower part of the jejunum, was found. It was about seven or eight inches in length and its greatest diameter was about two and one-half inches. About fifteen inches of the intestine were excised and the divided ends brought together by suture. At the time of operating, the growth was regarded as a carcinoma. It was hard and nodular, and the wall of the intestine was much thickened; its lumen was constricted to such an extent that a large surgical probe could pass through with considerable difficulty. The specimen was turned over to the pathologist, who puzzled over it for many weeks, and finally came to the conclusion that it was a case of hyperplastic tuberculosis. Hartmann himself was in this country at the time, and said the specimens resembled his cases of that affection. Since the operation, the patient has gained about fifty pounds in weight, and she is apparently perfectly well at the present time.

In regard to the second case shown by Dr. Dowd,—that of annular carcinoma of the cæcum and colon,—the speaker said he quite agreed with Dr. Dowd in his advocacy of uniting the ileum and the colon by lateral implantation. Dr. McCosh said that in a number of cases where he excised the cæcum, he found that the lateral method of uniting the divided ends of the gut proved very satisfactory. In these operations, however, he has usually sutured the ends together, preferring that method to the use of the button.

DR. A. B. JOHNSON said that about a year ago he saw a case of tuberculosis of the cæcum not unlike the one shown by Dr. Dowd. The patient was a young woman, who entered the hospital with multiple lymphomata scattered throughout all the regions of the body where lymphatic glands occur, notably in the neck, groin, and axillæ. A large number of masses, of varying size, could also be felt through the abdominal wall. The diagnosis not being entirely clear, one of the small tumors in the groin was excised and found to be tuberculous. The small wound made by the excision of this gland healed without any delay, and the woman was about to leave the hospital, when she became seriously ill with fever, abdominal pain, and distention, and the usual signs of a purulent peritonitis. There had been noted, in

the region of the right iliac fossa, a tumor of very considerable size, and, as this seemed to be the chief seat of the pain, an incision was made on the right side of the abdomen. This disclosed a very extensive purulent peritonitis, and the cæcum and first part of the ascending colon were involved by tubercular disease. The intestine formed a nodular mass about two and one-half inches in diameter, and extending for some distance up the colon. The apparent cause of the peritonitis was that one of the tuberculous masses connected with the cæcum had broken down and given rise to a mixed infection. Nothing was done at this operation further than to thoroughly irrigate the peritoneal cavity, and the wound was packed. It had only partially healed when the patient left the hospital. She subsequently entered the City Hospital, where she came under the care of Dr. Howard D. Collins, who found a sinus connected with the old wound. Upon learning the previous history of the patient, he excised the cæcum and united the ileum to the healthy portion of the colon above, as Dr. Dowd did in his case. The patient recovered, and is now in a fairly comfortable condition. She is still suffering from disseminated tuberculosis, and a small sinus remains in the region of the operation.

DR. WILLIAM B. COLEY said he had removed the cæcum and an adherent and involved loop of small intestine for carcinoma in one case, and had employed two Murphy buttons, making an end-to-end union in the small intestine and a lateral anastomosis between the ileum and ascending colon. The patient lived two years, and died of general colloid carcinomatosis of all the abdominal organs.

DR. GEORGE WOOLSEY said he now had under observation a patient operated upon two years ago for appendicitis. The appendix proved to be tuberculous and a sinus persisted. Upon scraping it out, it was found that the margins of the cæcum had become tubercular, and they were scraped and sutured. The sinus, which had closed for a time, again reopened, and about two months ago Dr. Woolsey excised a part of the cæcum and brought the healthy ends together. Up to the present time the fistula has remained closed.

DR. DOWD, in closing, said that in his case the submucous coat of the intestine at the site of the tuberculous nodule was distinctly thickened. The pathologist, Dr. Field, made a very careful examination, looking through many specimens, and he

was unable to find anything distinctive of tuberculosis excepting three tubercle bacilli.

EXARTICULATION OF THE HIP.

DR. OTTO G. T. KILIANI presented through Dr. John Rogers two cases of exarticulation of the hip for tuberculosis. The first patient was a man, twenty-three years old, who was admitted to the hospital on February 5, 1901. One year previous to the date of his admission his left knee became swollen and painful. Two months later the joint was opened and scraped. The operation was followed by relief for two months, when a recurrence took place.

On February 12, 1901, an incision into the knee-joint revealed complete tuberculous disintegration, and in consequence of this the limb was amputated about the middle of the thigh. The wound closed primarily. On March 20 an abscess developed in the scar, which, on being opened, revealed a fistula leading to bare bone. Various methods of treatment, curettage, iodoform, etc., failed to affect it. On April 27 the limb was disarticulated at the hip. An iodoform gauze drain was inserted from the joint and from the tip of the stump. A number of fistulæ persisted. These were subsequently laid open and connected along their entire track. On August 30, 1901, the wound finally healed. There has been no local recurrence, and the patient has gained twenty-five pounds since the operation.

The history of the second case shown was very similar to the first. The patient was a young man with tuberculosis of the knee-joint, necessitating amputation through the middle thigh. Subsequently there was a recurrence in the stump, and his condition became so grave that disarticulation of the hip was done with excellent results. Both of these patients wore an artificial limb.

GOITRE; EXCISION AND ENUCLEATION.

DR. KILIANI also presented two cases of goitre. The first case shown was one of the colloid variety. The patient was a man, thirty-eight years old, who had suffered from goitre for eighteen years. During this time it had slowly increased in size, but, with the exception of the disfigurement, it had given no cause for complaint. Examination of the neck anteriorly showed

a large, globular tumor almost the size of an orange. Above, it masked the thyroid cartilage; below, it extended to the suprasternal notch. Laterally, it was bounded by the borders of the sternomastoid. The tumor was tense, smooth, and almost fluctuating.

On February 5, an incision was made in the median line of the neck, extending over the entire length of the tumor. It was enucleated with considerable difficulty on account of the dense adhesions surrounding it. After ligation of the vessels, the cavity was packed and the wound drained and partially sutured. During the night a profuse hæmorrhage took place, necessitating repacking of the wound.

In the second case the tumor proved to be an adenoma. The patient was a girl of sixteen, unmarried. She was born in Bavaria, and had but recently come to this country. The goitre had existed as long as she could remember. She complained only of the disfigurement of a hoarse voice. The tumor involved principally the right lobe, although the entire gland was somewhat swollen. She had no symptoms of Basedow's disease.

On January 21, the so-called collar (Kocher) incision was made, with a vertical prolongation downward. The vascular supply in this case was very marked. The superior thyroid trunks were ligated, and the other vessels tied separately at their point of emergence from the gland. The isthmus was ligated *en masse* and divided. Drainage was inserted at the lower angle of the wound. The patient was discharged cured on February 5. Her voice has improved since the operation.

Dr. Kiliani said that these two cases of goitre represented two of the most common types. One was an adenoma, of which the right lobe and the isthmus were excised; the other was a colloid, which was enucleated. In the case of the adenoma, the operation was unusually difficult on account of the remarkable development and enlargement of the vessels; the other operation was exceedingly simple and quick.

DR. JOSEPH A. BLAKE, in discussing Dr. Kiliani's two cases of goitre, said he thought the operation of excision was a better and safer one than enucleation. He had generally found excision quite easy. If the vessels are divided between ligatures, there is very little bleeding; enucleation, on the other hand, may be attended by alarming hæmorrhage.

ELEPHANTIASIS OF PERINEUM AND SCROTUM.

DR. KILIANI presented a man, forty-seven years old, who denied syphilis, and whose family history was negative. The onset of his present trouble dates back eighteen months. Examination showed that the skin of the adductor side of the left thigh, the perineum, the left side of the scrotum extending upward to the inguinal region presented a tumor-like appearance. The skin was in thick folds, like molten lava, hard, and perforated by innumerable fistulæ discharging thick pus. The course of the disease was marked by chills and fever, and by infection of the inguinal glands, which went on to suppuration. There was a gradual loss of flesh and strength. A blood count showed 2,920,000 red cells; 8800 white cells, and 51 per cent. of hæmoglobin.

On January 7 double castration was done, and the thick skin covering the scrotum and surrounding parts was excised, the area involved being altogether about a square foot. On February 4 the denuded area was covered with skin-grafts. Since the operation the man has gained twenty pounds in weight. A blood count, recently made, gave the following figures: Red cells, 4,240,000; white cells, 7000; hæmoglobin, 72 per cent. The tissue removed was submitted to a pathologist, who made the following report:

"The layer of epidermis is in most places not materially thickened. But as there is a hypertrophy and hyperplasia of the papillæ of the corium, we see an uneven and wavy outline of the epidermis that in some places resembles papillomatous outgrowths. The corium, as a whole, is considerably thickened. In some places there is noticed a mucoid degeneration of the papillæ. The fibrillary connective tissue is considerably increased; here and there one sees new formation shown by the presence of fibroblasts with cell division. The coats of the blood-vessels are frequently considerably thickened, and in a good many of the capillaries one finds a proliferation of their endothelial cells. In the connective tissue, sometimes very poor, sometimes very rich in cells, one notes interspaces that are densely filled with round cells, with a large nucleus, situated in the centre of the cell or a little eccentrically, and rich in chromatin. These are proliferated endothelial cells of the lymph spaces. In some there is still a small lumen to be seen, in others the cells fill it completely. The

perivascular lymph spaces also show this cell proliferation, so that a good number of blood-vessels seem perfectly to be embedded and surrounded by these cells. There are a good many places where an active inflammation is going on. Here we find a dense, small, round-cell infiltration."

EXTRAVASATION OF URINE: RETROGRADE CATHETERIZATION.

DR. C. L. GIBSON presented a young man, who, last December, without any previous history of venereal disease, suddenly found himself unable to urinate, and in addition his penis and scrotum began to swell. When Dr. Gibson first saw him, on December 10, the condition had lasted three days. There was well-marked extravasation of urine, with infiltration of the perineum, scrotum, and penis. His bladder was so much distended that it reached almost to the umbilicus. After doing a retrograde catheterization, the perineum was opened backward on a staff. In addition to this the scrotum was incised in the usual manner, being cut into ribbons, and the penis was also incised in several places.

An interesting feature of the case was that during the patient's convalescence he suffered from polyuria, sometimes passing as high as 310 ounces of urine in twenty-four hours. The polyuria was evidently of nervous origin.

Dr. Gibson said he did not advocate retrograde catheterization as a rule, but in this case that method of procedure was rather tempting on account of the ease and rapidity it could be performed with the distended bladder. The scrotal and penile wounds have healed perfectly and without deformity or loss of substance.

REMOVAL OF THE SUPERIOR GANGLION OF THE CERVICAL SYMPATHETIC FOR GLAUCOMA.

DR. WILLIAM B. COLEY presented a man, aged sixty years, referred to him, by Dr. David Webster, for operation for the removal of the sympathetic ganglion. The patient had lost the entire sight of the left eye from the glaucoma two years ago; the sight of the other eye has been gradually failing during the last year, and during the last few weeks he had been hardly able to get about with a cane, and had not ventured into localities

where he was not well known. Operation was performed February 5, at 3.30 P.M., under ether anæsthesia; assisted by Dr. W. E. Dann and the house staff of the General Memorial Hospital. Incision was made anterior to the sternomastoid muscle, three and a half inches in length. The sheath of the vessels was exposed and the jugular vein and carotid artery lifted up without separation of the sheath. At first he attempted to find the nerve lying on the scalenus anticus muscle as it is usually described in the anatomies. Profiting by the experience of Dr. J. Chalmers Da Costa and Dr. Hearn, of Philadelphia, who had recently performed the operation, he looked beneath the sheath of the vessels and found that the ganglion had been lifted up with the sheath; it was easily separated and exposed in its entire length. Before removing it, the sympathetic nerve was seen just within the sheath of the vessels. The cervical ganglion was fusiform in shape, and in its largest portion about the size of a slate-pencil, three-eighths inch in diameter. It was dissected free up to its entrance into the skull and then cut off as far as possible. About two inches in length were removed. The wound was closed with a slight drain in the lower angle; primary union followed. The face of the patient was somewhat flushed at the time when the ganglion was removed, and when putting on the bandage there was marked cyanosis, due partly to too much pressure on the neck. On loosening the bandage the circulation improved.

After History. The patient complained of some headache for the first two or three days following operation. At the end of one week the improvement in vision was well marked. At the time of his admission to the hospital, he had been hardly able to distinguish the clock on the opposite side of the wall, about thirty feet away. At the end of one week he did not only distinguish the outline of the clock, but was able to tell the time of day.

Examination by Dr. Webster, February 20, 1902, is as follows: Condition shows marked improvement; vision and field have both improved, but the tension is still a little subnormal. Examination before operation showed, $V = \frac{20}{50}+$; after operation, $\frac{20}{30}-$.

So few of these operations have been done in this country, and the results are so recent, that it is impossible as yet to form a correct judgment as to the value of removing the cervical ganglia for glaucoma. A study of the older cases done in Europe

shows somewhat variable results. The operation was originated by Jonnesco, and was employed mostly for exophthalmic goitre; but Jonnesco himself has operated upon two cases for subacute and chronic glaucoma. His results show immediate and lasting improvement (1) in the diminution of ocular tension; (2) in marked and permanent contraction of the pupils; (3) in diminishing the frontal headache; (4) permanent improvement in vision.

Jonnesco in the original operation removed the superior middle and inferior ganglia on both sides, and yet, with this difficult and necessarily prolonged operation, he had no mortality.

Burchard was the first to perform the operation in England (*British Medical Journal*, September 20, 1900). He reports three cases, in two of which there was marked improvement in intra-ocular tension; while little effect was noticed in the third.

Taking the results as a whole, it would seem that in certain selected cases of glaucoma the operation is likely to prove of considerable value.

DR. DAVID WEBSTER said the patient shown by Dr. Coley had been under his observation for a little over a year. When he first saw him the patient had already lost his left eye from glaucoma absolutum, and he was suffering from what was supposed to be a simple glaucoma of the right eye. In both eyes the optic disks were cupped. The excavation was deep in the left, shallow in the right. The right eye was painful, and there seemed to be a considerable degree of atrophy of the optic nerve. The tension was increased at times. The speaker said he hesitated to operate on the affected eye, as the result of operation in similar cases had not been very encouraging. In comparatively few had the disease been arrested, while in some it was accelerated by the operation, and in others operative interference had produced loss of sight. The patient was treated for a time with pilocarpin and eserine to keep down the tension, and with strychnia hypodermically on account of the atrophic element in the case; but when these drugs were stopped, the sight grew a little worse. The central vision varied between 20-40ths and 20-30ths, but towards the last it became as low as 20-50ths. The visual field was gradually but surely closing down, and Dr. Webster said that when his attention was called to the operation of removal of the superior

ganglion of the cervical sympathetic for glaucoma, and he learned of the beneficial effects following the operation in a number of instances, he did not hesitate to suggest it to this patient. The speaker said that, so far as he knew, this was the first case of excision of the superior ganglion of the cervical sympathetic for glaucoma where an iridectomy or some other operation on the eyeball had not been previously done. Since the operation, the patient has had better central vision than he has had at any time since he came under observation. He is able to make out all the letters in 20-30ths, and can distinguish one letter in 20-20ths, and his visual field has almost doubled.

MOTOR APHASIA DUE TO A SMALL CORTICAL
HÆMORRHAGE IN THE REGION OF
BROCA'S CONVOLUTION.

DR. L. W. HOTCHKISS presented the report of a case operated upon for the above condition, for which see July number of the ANNALS OF SURGERY.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, February 3, 1902.

The President, RICHARD H. HARTE, M.D., in the Chair.

INTESTINAL SUTURE.

DR. EDWARD MARTIN, in a discussion upon the above subject, said that for some time Drs. Carnett, Levi, and himself had been trying the various methods of sewing animal and human intestines. The speaker wished to detail some of the conclusions which they had reached.

The difficulty incident to making an end-to-end intestinal suture is dependent upon the loose, flabby, slippery nature of the tissues involved, its deep position, and particularly the tendency of the mucous membrane to prolapse. Of the many different methods of end-to-end suture, those which now are received with most favor are the Murphy button apposition, the Maunsell invagination, the Lembert suture, the suture facilitated by the O'Hara forceps, and, latest, and in some respects best, the Connell method of suture, all the knots being placed within the lumen of the intestine.

Considering the use of the different devices for facilitating sewing, they found the Murphy button and the O'Hara forceps perhaps the most practicable. By the O'Hara forceps the junction is a little more rapid. His own experience with the Murphy button was comparatively limited. He had used it in one case of resection of the pylorus with part of the stomach, and the final junction between the stomach and duodenum was made by means of the Murphy button. The man ran a smooth course until the seventh day, when he was given, by inadvertence, a full-sized egg-nog. He vomited, went into collapse, and died. The Murphy button had given way; moreover, the swollen mucous membrane

had entirely occluded its lumen. Sometimes the button is the only thing that can be used; but, under ordinary circumstances, after intestinal resection where the parts are fairly accessible, we have other and better means.

The O'Hara forceps offers an admirable means of rapid, easy, safe suture, provided the stitches be passed deeply; but the diaphragm is left too large. In one dog subjected to an end-to-end suture by the Connell suture, and lower down to a similar procedure by the O'Hara forceps, some hard fæces which passed through the upper line of junction lodged in the lower and produced an obstruction. The line of the diaphragm is perhaps a third of an inch in width all around, and this may produce sufficient narrowing of the lumen, to make a difference between life and death to a patient whose bowels previously have not been cleared out. Also where the bowel walls are thick, the forceps may knuckle or double over.

The Lembert suture is fairly rapid, provided the gut be anchored properly. In anchoring and in applying these sutures, they found the forceps devised by Allis, that is a modified tenaculum forceps, of the greatest help. In the Lembert suture the question has been discussed as to whether it should be continuous or interrupted; and, indeed, that question is a very common one for decision in regard to all forms of intestinal suture. After first closing the mesenteric junction,—which should always be done by a rectangular suture tied on the mucous surface,—three anchoring sutures are applied, one to either side of the mesenteric attachment and one at the portion of the gut farthest from this attachment. Two continuous sutures are then run from the stitch at the side of the mesentery to that on the convex border. There are then six interruptions. None the less in dilating the bowel there is always a more distinct constriction than where interrupted sutures are placed throughout. The latter, however, take much more time in their application.

In regard to all intestinal sutures, it seems clear that the dread of penetrating the mucosa is one of the legacies left from pre-antiseptic days. The peritoneum will stand a great deal of insult if it is not soiled; it will stand some soiling if not insulted; but the combination is deadly! If there be infection carried by the threads traversing the mucous coat, there are few records to prove it. Cases of fatal peritonitis are not due to penetration of

the mucous coat, but to failure to include the submucosa. If the sutures are applied properly, some of them are almost certain to penetrate some part of the mucous membrane.

Knots on the outside are supposed to increase the danger of peritonitis. Connell and Maunsell devised their methods of suture for the purpose of avoiding this danger. Connell's suture has seemed strong, perfectly safe, and has produced the smallest diaphragm.

In experimenting with the Maunsell invaginated method after using this Connell suture, one is liable to become confused as to the proper method of applying the suture, since in one case the gut is simply turned inside out, in the other it is invaginated. The Maunsell method is rapid, easy, and safe. The main objection to it is that it requires an added incision, which must be closed by the Lembert method. The thread used should not be too fine to be handled readily, nor should it fit the eye of the needle so closely that it readily slips out. A fine Chinese twist is preferable. The ordinary dissecting forceps is not very serviceable, but the tooth forceps is of the greatest use. The double tenaculum and the instrument devised by Allis are both serviceable and both expedite the operation. The sweet and white potato plates, bone plates, bone bobbins, and other mechanical contrivances, have not been employed. For the removal of a carcinoma involving the entire circumference of the stomach, one-third of that organ was removed. Its continuity was restored by the rectangular suture knotted on the mucous membrane, the closure being completed by two Lembert sutures. This patient made an uneventful recovery.

The next important element in the successful closure of an intestinal defect incident to resection is the manual dexterity, which can only come from long practice, such as is only practicable in the laboratory upon living animals and upon human cadavera.

DR. DE FOREST WILLARD had had the opportunity to see Dr. Connell make the application of his suture, and was struck with its exceeding simplicity and with the rapidity of the operation; also with the security with which he was able to bring the two ends of the intestine together. His end-to-end anastomosis would evidently stand a very considerable amount of strain. His experience demonstrates that there is less danger of leakage by this

method of suturing all the coats of the intestine than by the old method of endeavoring to pick up the peritoneum and muscular coat.

Leaving all the knots within the lumen is certainly most desirable. The absence of a foreign body, like the Murphy button or any device of its kind, is of very great advantage. Those who have used the Murphy button, and have not been able to find it for several weeks afterwards, are always anxious as to its ultimate disposition. If there are a number of points of narrowing of the intestine and a Murphy button is inserted above, it may cause secondary obstruction. The Connell method is simple and effective, and with the use of the Allis forceps or the O'Hara forceps, or both, the procedure is a rapid one.

DR. JOHN B. DEEVER had not been sufficiently impressed with the Connell suture to give up the Lembert operation. While he did not say that the Connell suture is not equally as good, he had always made it a rule that where a suture, or any type of surgical procedure, had served him well, not to give it up for any new method. He had never had any difficulty in closing the ends of a bowel. He whipped the mucous membrane, removing the clamps or rubber tube, when the bowel inflates and makes the introduction of the continuous Lembert suture comparatively easy. He had had occasion recently to use the bone bobbin, devised by Mr. Robson, of England, and could say that it offered some advantage.

As far as the Murphy button is concerned, it only has a certain field. He, too, had gone through the ordeal of waiting for patients to pass the button.

In one of the first operations done with the segmented rubber ring, he had to open the bowel later and remove the segments of ring. With the Murphy button, the operation of cholecystoduodenostomy is made comparatively easy.

DR. W. L. RODMAN said that unquestionably the trend is in the direction of direct suturing and doing away with mechanical aids. In talking with Dr. Murphy on this subject, the speaker had been led to believe that he considered many bad results had occurred from using buttons too large or improperly manufactured. He had had no unpleasant experience with the Murphy button, and could do better work with it than with other methods, and it undoubtedly is the most rapid way of making an anasto-

mosis. There are objections to it which have been already stated; but, if the button is properly selected and is made by the best of instrument makers, it will not prove disappointing in many instances.

DR. MARTIN agreed with Dr. Deaver that it was best to continue the method with which one is familiar. The old Lembert suture, properly applied, gives admirable results. There are practically no records against it to show, when it is used properly, that it is not good. It seems, theoretically perhaps, that the knots within the lumen and the rectangular suture represent a better method; it is slower than the Lembert, but representing, as it does, a strong line of union, it might be well to adopt it as one of the resources when there seems to be special danger of a suture-lining giving way. One objection to the Murphy button is the expense.

THE RADICAL CURE OF HÆMORRHOIDS WITHOUT THE USE OF GENERAL ANÆSTHESIA.

DR. GWILYM G. DAVIS read a paper upon this subject, in which he said that the desirability of some method of treatment by which internal hæmorrhoids can be cured without the necessity of resorting to general anæsthesia has long been evident. The commonly used methods of treatment are those of the ligature or clamp and cautery under general anæsthesia and the injection of carbolic acid or other coagulant without anæsthesia. Any formal operation for hæmorrhoids is often declined for two reasons,—the patient is afraid to take an anæsthetic and undergo an operation, or alleges that he cannot spare the time necessary to be absent from his business affairs.

Experience with the injection methods has demonstrated that while satisfactory in many cases it is unreliable, and unpleasant or even serious results may occur at any time. The value and efficacy of cocaine on the mucous surfaces elsewhere suggested its use for rectal troubles, and the method proposed is a combination of it with the electrocautery. The hæmorrhoids are to be exposed to view by means of a speculum. Every surgeon probably has a favorite rectal speculum. At present, the one preferred by Dr. Davis is that known as Kelly's sphincterscope. It is cylindrical, two and a quarter inches long, cut off square at the end, and is used with an obturator. It is not self-retaining, but after

being introduced, the patient himself can hold it in place, as it has a large, firm handle. The speculum having been inserted, a pledget of cotton an inch or so in length is moistened with a 4 per cent. solution of cocaine and introduced, being allowed to remain as the speculum is withdrawn. In a few minutes the speculum is again introduced, the cotton removed, and the speculum partly withdrawn and turned from side to side until the hæmorrhoid on which it is desired to operate is brought well into view. The patient then takes hold of the handle of the speculum and holds it in position, while, with a small electrocautery knife, such as is used in nasal operations, the hæmorrhoid is either seared superficially or a line burnt in it, or one or more punctures made as deemed most suitable. Especial care should be taken not to encroach on the skin, but restrict the application to the mucous membrane. The cautery point may cause bleeding. The blood can be wiped away with cotton in a pair of forceps held in the opposite hand, and, if it is too free, the operation may be suspended. A piece of cotton is then pressed on the bleeding point and allowed to remain as the speculum is withdrawn.

Bleeding into the bowel and distention of the rectum are to be avoided by not applying the cautery too high up, as otherwise the sphincter may fail to compress the bleeding point. One locality is enough to treat at a visit. The cotton does not produce any discomfort because of the anæsthesia produced by the cocaine, and the bleeding is controlled by the contraction of the sphincter. The cotton is passed out at the next movement of the bowels. The operation had better be done late in the day, so that after the application the patient may return to his home, lie down, and rest for the night. By the next morning any irritation which may have been produced will have subsided, and he may resume his business. It is better to allow perhaps a week to intervene before another application, as otherwise the wound previously made will not be sufficiently advanced in healing. By persistently working in this manner, the hæmorrhoids can gradually be removed.

Each operator must evolve his own technique, and this can easily be done by beginning with a single small application of the cautery and observing its effect on the patient. The applications can then be increased both in frequency and extent, according to the judgment of the surgeon.

The method is not advisable in every case. In some the hæmorrhoids are so extensive that treatment in this manner would be too tedious and consume too much time, but in a certain class of cases it will be found quite satisfactory.

DR. EDWARD MARTIN said that the common teaching for a great many years, in regard to treatment for affections about the anus, was that stretching the sphincter was essential to the comfort of the patient. A rectal fissure was treated, first, by overstretching the sphincter, then by cutting, then by curetting or removing the fissure. These procedures have long since been shown to be unnecessary, though often there is excited a tenesmus, which causes great anguish and aggravates the local inflammation. One reason for wishing to operate on these cases without an anæsthetic depends on the fact that the mortality for anæsthesia is higher for rectal operations and for comparatively trifling operations than for any other class of surgical procedures. There seems to be a cardiac inhibition caused by stimulation of the rectum.

DR. W. L. RODMAN had never operated on such a case without a general anæsthetic until a few days ago. The patient had previously undergone an operation, and said that the ether had made him very sick; that he preferred to undergo the operation for hæmorrhoids without an anæsthetic. The speaker had no idea that he could stand the pain when he went on the table, but to the last he said he did not want anything. Three very large internal piles were tied and removed after stretching the sphincter. The man stood the operation surprisingly well without any anæsthetic whatever. In many instances the speaker used the clamp and cautery, though his preference was for the ligature. He had never had postoperative hæmorrhage occur in his own practice, but it is undoubtedly one of the dangers after the clamp and cautery operation. If the base of the pile be incised too near the clamp, and if the iron be used at a white instead of a dull heat, the danger of secondary hæmorrhage is great.

DR. WILLIAM J. TAYLOR called attention to the necessity of applying the heat slowly when the cautery is used. The pile should be cooked, not cut off. The cautery is used on either side, starting from the top, cooking it back and forth, until only a fibrous band supports the pile. He had never seen a hæmör-

rhage occurring after that method, but it takes considerably longer than when the hæmorrhoid is rapidly burned off.

DR. DE FOREST WILLARD said that we cannot too frequently emphasize the danger of these operations on the rectum where anæsthesia is employed. Even in simple cases serious symptoms may arise. He had practically abandoned the ligature, and rarely employed the Whitehead excision. He had had personal experience in the use of the ligature, with sloughing masses within the rectum, the presence of knots and ligatures, and the intense pain and discomfort that are found in these cases, no matter how thoroughly the sphincter has been stretched. He always preferred the clamp and cautery. If we use a clamp whose blades will close parallel and not in a V-shaped manner, then cut through the skin with scissors, so as not to have too thick an outer portion of the pile in the proximal end of the clamp, and then thoroughly incinerate the tissues, we will rarely have hæmorrhage. The after results are better than with the ligature, and there is less danger of subsequent contraction.

DR. H. R. WHARTON had formerly used the ligature in the treatment of hæmorrhoids, but was led to give it up after trying the clamp and cautery, simply because the patients on whom the ligature method was tried suffered so much pain. He had never seen hæmorrhage after the clamp and cautery. He had seen men operate with clamp and cautery in which they trimmed the hæmorrhoid too close, and hæmorrhage had resulted. He clamps the hæmorrhoid and then cauterizes with the Paquelin cautery at a dull, red heat. If the hæmorrhoids are large, he leaves one-eighth or one-fourth of an inch of stump at least free from the clamp, and then cauterizes this stump thoroughly. He regarded the operation as safe as that by ligature, and the convalescence is probably a little more rapid.

DR. JOHN B. DEEVER observed that in the after-treatment of these cases he made it a practice to withhold opium. He had the bowels moved on the second day, and encouraged a daily bowel movement.

DR. MARTIN said that the last time he had used the clamp and cautery he took particular pains to cook the stumps slowly and thoroughly. When he loosened the clamp there came an arterial gush, which was only checked by ligature. He had never used the clamp and cautery since. In addition the one

case of clamp and cautery suffered afterwards from stricture, and immediately following the operation experienced the most agonizing pain. Both these cases were exceptionally severe ones, and many others ran a perfectly smooth course.

DR. RICHARD H. HARTE said that it has often been urged that the ligature is a very painful method of treating piles, and that, on the other hand, the use of the clamp and cautery possesses all the desirable features of treating these cases. This, however, had not been his experience. If the ligature is intelligently used, but little pain or discomfort will follow its employment. He had frequently employed both methods on the same day of operation, and attempted to see if there was any marked difference in the amount of discomfort that the patients suffered. He was disposed to think that less pain was suffered when the ligature was carefully employed. The entire base of the pile should be freed and the vessels grasped in the loop of a small, strong, silk ligature. He never confines the bowels in these cases; and patients the next day are usually able to sit up in bed and read, and never express themselves as suffering any unusual discomfort.

DR. WILLARD said that as to the after-treatment of this operation, the patient's bowels should never be locked up. A soft stool can be passed through a sensitive rectum and anus with very little difficulty, but if, as in former times, the bowels are confined for many days, a large feculent mass must be extruded, an extremely painful process. The bowels should be kept soft from the second day, and a mushy stool secured daily thereafter.

DR. DAVIS said, in closing, that he wished to call attention to the fact that the rectum is tolerant of certain manipulations under cocaine. The surgeon had cases at times presented to him which are not so severe as to compel the individual to submit to a formal operation. To relieve those cases is the object of the operation presented by him.

TRANSACTIONS OF THE CHICAGO SURGICAL SOCIETY.

Stated Meeting, February 3, 1902.

The President, CHRISTIAN FENGER, M.D., in the Chair.

HÆMOSTASIS OF THE BROAD LIGAMENT.

DR. HENRY P. NEWMAN read a paper with the above title, for which see page 802.

DR. CHRISTIAN FENGER said that the principle of hæmostasis advocated by the essayist was the right one, although it was not new. Billroth's clamp, which he had used for years, answered the same purpose in a very effective manner, and Billroth added cauterization to that. As to hæmostasis in extraperitoneal extirpation of the uterus, one thought had occurred to him, namely, that in going down from above there was no trouble, but when he reached the uterine artery, unless he could see it, he would feel that some harm might be done to the ureters. He, therefore, felt better satisfied when he could isolate the vessel and catch it without anything else with it and ligate it. Personally, he liked to see everything he was doing when operating, particularly so far as hæmostasis was concerned.

DR. T. J. WATKINS stated that his experience with the angiotribe was limited to one case, which Dr. J. Riddle Goffe had operated for him, for vaginal hysterectomy. Some bleeding followed the operation, but the patient recovered, although she lost a large amount of blood. His greatest fear was hæmorrhage. He would not use the instrument in vaginal hysterectomy because now he almost invariably uses ligatures, and sutures the peritoneal, broad ligament, and vaginal wounds. He believed the wound should be closed the same as a wound in any other part of the body. The necessity of suturing the anterior vaginal wall to the broad ligaments is extremely important in cases where there

is any tendency to cystocele. It would seem as if there might be after use of the angiotribe an increased tendency to hæmorrhage in cases where the broad ligaments were much thickened and friable from the presence of inflammatory exudate. It is well known that ligatures in such tissue sometimes, if tied firmly, cut through, and cause much difficulty in the control of the hæmorrhage. It would seem to him that the angiotribe could not be used satisfactorily in cases of pyosalpinx involving the interstitial portion of the tube which indicates removal of a V-shaped section of the uterus which will include the entire uterine portion of the tube. He thought in deciding upon the indications for the use of this instrument one should consider its use as a general hæmostatic. Hæmostasis in the broad ligament should not differ from the hæmostasis in any other part of the body. If it is well to control bleeding in the broad ligaments by means of the angiotribe, it is well to control bleeding in all parts of the body by it. The blood-vessels of the broad ligaments should be ligated as is done in other parts of the body, and the time is past for the use of *en masse* ligatures. The artery should be tied separately.

Another advantage of the ligature method in the removal of pus tubes consists in shortening the broad ligaments. After the removal of a pus tube the support of the uterus is diminished on account of the removal of the upper portion of the broad ligament, and as a consequence, if both tubes were removed, the uterus tends to become retroposed. He frequently doubles the broad ligament wound upon itself; that is, he sutures the infundibulo-pelvic ligament to the uterine portion of the wound and then sutures together the approximated edges of the wound. There are two advantages accomplished. First, backward displacement of the uterus is absolutely prevented; second, all raw surfaces are covered, which minimizes the danger of adhesions.

DR. NEWMAN, in closing the discussion, said the angiotribe was originally designed to replace the retention forceps in doing vaginal hysterectomy, but that for the last two or more years in his own work and that of others its use had been extended to abdominal and general surgical work. The old retention forceps was a terror to the patient, caused great distress by pressure and dragging upon the tender surfaces, but the angiotribe enabled one to do away with that objectionable feature. The objection raised of not seeing the work done was not valid, for one should

be able to see what he was doing; for instance, in abdominal hysterectomy, with the patient in the Trendelenburg position, the operator should be able to get at the uterine artery. In vaginal hysterectomy one could by inverting and dragging down the uterus get at the ovarian artery so that he should see and know that he encircles the individual vessel with the catgut ligature in connection with the use of the clamp. There was no reason why the vaginal vault could not be closed by this method, and it was designed to do so. One should also be able to catch up the remaining portion of the amputated broad ligament, so as to anchor the vaginal vault, and provide against prolapse.

As to the objection raised by Dr. Watkins in regard to hæmorrhage by the combined method, the danger of bleeding was reduced to a minimum. He did not see how hæmorrhage could occur if the main branches were tied in the structures just within or beneath the compressed stump; there could be no slipping of the ligature, no retraction of the artery, and ideal hæmostasis should be obtained.

In regard to the interstitial portion of the tube being involved in septic infection, he referred to this in his paper. This was a valid objection against amputation or leaving a tubal stump; yet it should be guarded against in all instances by turning the instrument inward upon the cornu of the uterus, thus destroying this portion of the tube, or a V-shaped resection could be made, and then closed with catgut.

So far he had not spoken of the angiotribe as a general hæmostatic. He had seen fit to confine his remarks to broad ligament work, as the paper was designed to be presented before a special society, although its use was applicable to all general surgery. He used it in rectal work, as, for example, in operating on hæmorrhoids, prolapse of the bowel, pedunculated tumors, and, for that matter, any structure that needed to be amputated or clamped. In omental and peritoneal tissue he used it rarely, or fortified it with catgut ligature, inasmuch as such soft, fragile structures do not allow clamping with any degree of firm compression, and unless applied with great care it is apt to sever the blood-vessel. The same applied to œdematous conditions or infiltrated areas. It should be used there with great caution. By frequent use one acquired a knowledge of how best to use the instrument, the amount of force to use, the time and the applica-

tion to the different structures; as he became familiar with it, and gained confidence in the method, he would do away with the ligature in many instances. One danger of using soft ligature material such as catgut was that it might slip or loosen and hæmorrhage occur. But by the method he had outlined there was no slipping, as the suture material was buried in the meshes of the clamped tissue, or immediately beneath. The work that had been done in this country by means of the angiotribe had been confined to a few operators, but it had been very satisfactory to those who had used it extensively. Tuffier, Landau, and others had used it extensively with excellent results. Doyen, after using his own powerful instrument for some years, now advocates the combined angiotribe and ligature method.

ADENOCARCINOMA OF THE LIVER AND STOMACH, WITH RESECTION OF BOTH.

DR. L. L. McARTHUR reported the case of a man forty-two years of age, who had always enjoyed fair health until the present sickness. He had been employed at St. Luke's Hospital as an orderly. In 1894 he fell; in falling received a blow over the stomach and left side, which left a painful area over the liver, extended to the left, and for which he was treated, the case being diagnosed as "neuralgia of the stomach, lumbago, and sprain of the spine." Various other diagnoses were made prior to admission to hospital. In 1898 he began to have a great deal of epigastric pain after taking food, and suffered from constipation. He was admitted in the early months of 1901 to the medical department of St. Luke's Hospital, being treated for a catarrhal colitis and a gastritis. The pain and distress continuing, and the amount of food taken being so small because of pain, he became greatly emaciated, and finally was transferred to the surgical department. On examining the patient, he found a painful area over the epigastric region, presenting a sense of resistance which could not be positively said to be a growth, but which was associated with cachexia, vomiting, and distress on taking food. The idea of a carcinoma or round ulcer of the stomach occurred to the speaker, and he therefore advised an exploratory operation, with an attempt to remove the growth, if one were found.

On opening the abdomen, he encountered a mass in the anterior wall of the stomach, near the lesser curvature. The large

mass was fused with the under surface of the left lobe of the liver. The feel of the mass was that of a hardened, indurated growth, probably carcinomatous. He thought it wise to attempt to loosen the adhesion from the liver, and began to do so, when he found it extended to some distance into the liver substance, so with the knife he began cutting it quickly away through liver substance. He succeeded in loosening it from the liver, tamponing the bleeding liver tissue temporarily with dry gauze, while working on the growth in the stomach wall with a portion of the liver. As he was loosening the last portion of the tumor from the liver, his finger being behind the adhesion, he tore into the stomach, and some of the stomach contents escaped into the abdominal cavity, which had been packed off with sponges. He therefore made a hurried resection of the stomach wall, making an opening in the stomach wall about three inches in length and two and one-half inches in width. The stomach was then sutured with ordinary Czerny-Lembert sutures, and after mopping out the material which had escaped from the stomach, a Mikulicz gauze tampon was applied to the cavity in the liver, and the wound closed. The patient made a very nice recovery, and gained in weight from 108 to 128 pounds.

The case was interesting in this, that one should not be discouraged by the clinical aspects of a growth, and give up as hopeless an operation which ordinarily is considered so, to resect a portion of the liver and stomach; for the microscopical findings disclosed that the tumor was not a carcinoma, but an adenoma. Nearly a year had elapsed since the operation, and the patient is in perfect health, except that he has a partial diastasis, made necessary by the drain that was put in. The patient was able to attend to his usual work.

Dr. McArthur said it was probable, from the findings of the tumor removed and from the clinical history of the patient, that the case was one of round ulcer, the base of which had nearly perforated the stomach, but having the liver lie in contact with it an adhesion had formed, and after a number of years began to invade the liver and the surrounding stomach structures with this growth which had not the malignancy of carcinoma. He was inclined to think that the fall which the patient had in 1894 had much to do with the inception of the trouble, and so it was possible the ulcer of the stomach might have developed as a result of

trauma of the mucous membrane and the auto-digestion of the stomach wall by the gastric juices, such as may occur when the mucosa is absent.

DR. CHRISTIAN FENGER did not believe that this tumor was entirely benign. Benign adenomata had the character of the tissue or organ in which they originated. The distinguishing feature between adenoma and carcinoma of the liver was the encapsulation. They had not the tendency to pass into other tissues and infiltrate them, as was noted in the case of Dr. McArthur. In his opinion, the case of Dr. McArthur presented the characteristics of a carcinoma. On the whole, adenoma was composed of elements that looked like a normal gland. Adenomas of the rectum were usually of the polypoid form. If we had perfectly normal Lieberkuhn's glands, we called such a tumor an adenoma. It was impossible to draw a sharp line between adenoma and carcinoma, and that was the reason surgeons spoke about adenocarcinoma. In a tumor like the one that had been passed around, where the cylinders of the epithelial cells could be seen to lie in double rows between the connective-tissue cells, it was strong evidence that the tumor was carcinomatous.

DR. A. C. BERNAYS, of St. Louis, said he had never seen an adenoma of the stomach unless it were in the shape of a polypus. He had never seen an adenoma of the liver except in the form of an encapsulated hypertrophy or a nodule within the liver, perfectly normal liver tissue being plainly distinguished from the surrounding tissue. In the sections he had made of those cases he could say that the epithelial cells seemed to be larger than the epithelial cells of the liver in which the adenoma was contained, but when it came to seeing an adenoma starting in the stomach, invading the liver or any of the adjacent organs, he was inclined to be sceptical. Indeed, he was inclined to think that the tumor in the case of Dr. McArthur was a malignant epithelioma and not a benign adenoma. However, inasmuch as he had not seen sections of the tumor, he could not express a positive opinion.

DR. MCARTHUR, in closing, said he considered the case at the time of operation to be one of carcinoma, and prior to operation made a diagnosis of either round ulcer of the stomach or carcinoma developing from the base of a round ulcer. However, he thought primarily it was a round ulcer of the stomach that had undergone a malignant change during the seven or eight

years since the time the patient received an injury, and that the injury might possibly have incited the ulcer through a lesion of the mucous membrane of the stomach. On seeing the slide a year ago in the pathological laboratory of St. Luke's Hospital, he made a diagnosis of carcinoma, but to make assurance doubly sure he submitted slides to Professor Hektoen, who, after a careful study, was inclined to believe the tumor to be what he (Hektoen) designated as "adenoma simplex," and rendered a favorable prognosis. (Re-examination, February 15, 1902. Both Hektoen and Zeit pronounce it carcinoma.) Dr. McArthur, however, gave a grave prognosis as to recurrence; and while a year was rather a short time to say whether the tumor was going to recur or not, at present there were no signs of recurrence. The patient continued in good health, was able to do his work, and had increased materially in weight.

SARCOMA OF THE MESENTERY; RESECTION OF ONE HUNDRED AND NINETEEN INCHES OF SMALL INTESTINE; RECOVERY.

DR. A. C. BERNAYS read a paper with the above title, for which see page 790.

DR. CHRISTIAN FENGER said that Dr. Bevan had asked him whether the case might not be one of tuberculosis. As to appearances, he thought the specimen was more like sarcoma than tuberculosis. One would expect in the vicinity of a tuberculosis the presence of more nodules. Such nodules were absent in this case. Of course, there was such a thing as conglomerated tuberculosis; also localized tuberculosis, that had been compared to lupus. So far as he could determine, there was no primary tuberculosis of the intestine, and appearances indicated sarcoma rather than tuberculosis.

DR. BERNAYS said the statements of Dr. Fenger regarding the pathology were interesting. The reason he thought it might be tubercle was that there were cheesy, yellow-looking spots. It was a peculiar lumpy tumor, which resembled very much what he had heard Virchow describe and demonstrate as conglomerated primary tuberculosis. He looked for primary tumor somewhere in the intestine, but could not find any primary intestinal lesion. He thought it was a primary sarcoma of the mesentery, and that the microscopists were right in what they had said regarding the specimen.

TRANSVESICAL CAUTERIZATION AS A SUBSTITUTE FOR THE BOTTINI OPERATION.

DR. A. I. BOUFFLEUR read a paper with the above title, for which see July ANNALS OF SURGERY.

DR. E. WYLLYS ANDREWS agreed with some of the statements made by the essayist, but thought his conclusions were not deducible from his premises; for example, the statement that the transvesical or open operation was safer and more surgical than the Bottini was unwarrantable. We had an admirable operation in transvesical cauterization for checking dangerous hæmorrhage, but an operation added to an operation could not give less than the mortality of one of them alone. We could not add anything to a cystotomy and get a lower mortality than cystotomy gave, and that operation gave two or three times the mortality the Bottini operation did. No surgeon had ever obtained a low mortality from cystotomy. All statistics prove this. The same question arose with reference to the relative mortality of lithotomy and litholapaxy. Those who had had enough experience to warrant them in drawing conclusions had uniformly agreed that lithotrity or litholapaxy gave a low mortality. The speaker mentioned an East Indian surgeon who, he said, had done thousands of operations for stones where American surgeons had only done scores of them. In India the most experienced operators avoid the cutting operation. One could not get cystotomy down to a low mortality, but he could the Bottini operation. Some of the reasons that had been advanced against the Bottini operation were not applicable at the present day, because surgeons had learned to avoid the risks attending it. He had intended to exhibit a specimen showing how in one case he had burned half an inch of the membranous urethra too far with the Bottini iron, and caused a fatal hæmorrhage, the patient dying a week later. He mentioned another death following a Bottini operation from uræmia. In both cases he used a general anæsthetic. He thought if surgeons could exclude general anæsthesia in performing Bottini operations, they would not lose as many patients. Any operative procedure like the Bottini operation, which gave results in so many apparently hopeless cases, though it failed in others, could not help but have a status in surgery. He had seen patients who had been troubled with reten-

tion of urine for many years, yet a few hours or days after a Bottini operation they passed urine freely, and continued to do so from that time on. He recalled seeing an old man, eighty years of age, in consultation with Dr. Greensfelder. The patient was too weak to take ether or chloroform. Local anæsthesia was resorted to, a Bottini operation was done, and three days thereafter the patient was passing urine freely, although he had been a catheter slave for years. One could not get around such facts. It is the cystoscope which helps us decide which cases the Bottini operation will help. When a cutting operation must be done, the choice of methods would not be cauterization, but prostatectomy, which in the speaker's experience was one of the most satisfactory of modern operations, especially by the perineal route.

DR. L. E. SCHMIDT said that the statement was frequently made in medical journals by well-known authors that the Bottini operation was criticised by those who had probably never done the operation, or by those who had only done it a few times, and possibly by those who had not taken pains to work out the technique, and who had not taken sufficient care to make a correct diagnosis in regard to the prostatic hypertrophy. There was no question that all those who had performed the Bottini operation did not resort to it in every case. He thought it was poor policy to advocate any one operative procedure, and as the technique of the Bottini operation was developed and diagnoses were more accurate, the number of cases suitable for this operation was becoming smaller and smaller. However, this was not an argument against the Bottini operation *per se*. The charge that the Bottini operation was absolutely done in the dark was not true if all points were considered at the present time. Those who were familiar with cases of hypertrophy of the prostate would admit that the contour of the prostate could be made out both within and without; also the anteroposterior and lateral diameters could be determined, so that the length of the incisions posteriorly and laterally could be figured out with such accuracy that the operation, if the cases were carefully selected, ought to be crowned with success.

As to what the essayist had said about Horwitz selecting his cases, he (Horwitz) divides his cases into three groups. Good results were obtained from treatment in the first group for the reason that the cases were simple and uncomplicated.

In regard to the statement that Horwitz relies on rectal examination, he was under the impression that Horwitz uses the cystoscope in all his cases; and furthermore believes that if a case cannot be cystoscoped, one should not operate. He thought if one was going to do a bloody operation, one might as well make a prostatectomy in place of a suprapubic operation, with the addition of cauterization. The operation outlined by the essayist was done by Fuller in 1900. It had been performed several times since. Fuller himself had stated that after the introduction of the instrument the cautery would not work; a suprapubic operation was done, supplemented by cauterization with the ordinary Paque-lin cautery.

With reference to complications attending the Bottini operation, those who had modified this operation would not meet with as many accidents, neither would they encounter the same complications as those who did the operation for the first time.

Another operation by Wishard, which is practically similar to the one described by the essayist, has been done through the perineum. A tube about an inch in diameter is introduced through a perineal incision into the viscus, and the intravesical part of the tumor is thoroughly examined. Then through this tube the cautery is introduced, and then practically Bottini incisions are made through the tube in the perineal opening.

DR. BOUFFLEUR, in closing the discussion, said, in reference to the point made by Dr. Andrews as to the mortality of cystotomy, that the mortality from this operation as ordinarily considered was based upon a long series of cases, many of the operations having been done long before the present technique was instituted and practised. Cystotomy was not performed for the relief of the milder forms of obstruction nor for cystitis until it became very septic in character. The catheter was used until marked cystitis was present, and when sepsis occurred, but not until then, was drainage by cystotomy established. The mortality of early suprapubic cystotomy should be practically *nil*.

As to deaths, particularly the two mentioned by Andrews,—one from hæmorrhage and the other from uræmia,—deaths have occurred from uræmia following the Bottini operation under local as well as general anæsthesia, just as death sometimes followed any instrumentation of the urinary tract, particularly if sepsis were present. Death from uncontrollable postoperative hæmor-

rhage appears to have been frequent after the ordinary Bottini operation.

The method suggested in the paper was a substitute for the Bottini method in the treatment of some of the forms of prostatic hypertrophy. In very old and weak men the question of its being ruled out by general anæsthesia must be considered. He could see plainly there were cases in which the contraindications to general anæsthesia were so marked that any other remedy, which could be applied under local anæsthesia, should be resorted to because the dangers of the Bottini operation would be less than the dangers of the anæsthetic. In such cases we must simply choose the method which affords the least danger.

As to the remarks of Dr. Schmidt about opinions emanating from those who have not done the operation, it did not lessen the fact of a surgeon being able to judge of the indications for and the faultiness of technique of some procedure. If such were not the case, it would be necessary for all of us to travel over the same ground as our predecessors and to make the same mistakes before being able to avoid them. Improvements could be made by those who had not performed these operations based on a study of the reported results as well as of mechanical facts. For instance, it would seem incredible that any one would think of using an instrument with one long beak to divide hypertrophies of all degrees. Freudenberg, who had done more of these operations than anybody else, had cut clear through the rectum with his own instrument. Young had demonstrated that this could be obviated by using blades of different length. It was not necessary for him to burn into the rectum to demonstrate the possibility of such an occurrence, nor to devise means of avoiding it.

As to the operation not being indicated in all forms of prostatic obstruction, he stated that Horwitz thinks it is as applicable and useful in adenoma and fibroma as it is in inflammatory enlargement of the prostate. Young believes that it is indicated in all forms of hypertrophy, even to the valve formation which Horwitz excludes. Kreissl believes it is indicated only in moderate degrees of enlargement of one or two of the lobes. There was a marked difference of opinion as to the indications for the operation among men who were using it.

As to the accuracy of diagnosis, genito-urinary surgeons had made many mistakes in their diagnoses with reference to the

forms of prostatic obstruction. Men who were familiar with the bladder and its pathological conditions had confessed to making mistakes in diagnosis. He disagreed with Dr. Schmidt that a surgeon could invariably get the matter down so fine as to determine with mathematical precision, by the use of the cystoscope and other aids, the size and relationship of the intravesical enlargement. Men who are more familiar with the revelations of the cystoscope than any one present, and who were making these examinations frequently, had confessed that this could not be done. He said that Horwitz believes a diagnosis can be made by a rectal examination and the use of the cystoscope, but he implies that he relies largely upon a rectal examination.

Speaking of cystotomy as being a bloody operation, he would like to know what could be more bloody than a profuse or fatal hæmorrhage following a Bottini operation. Personally, he would not care to have a patient die of hæmorrhage from the urethra. He would have an opening in the bladder and control hæmorrhage from above, so far as it was possible to do so; and if all of the incision was confined to the vesical aspect of the prostate, this could be readily accomplished.

As to accidents occurring in the hands of the inexperienced, this was not always the case. Accidents occurred in Freudenberg's hands. Young admits that they would have occurred a number of times in his hands if he had not taken Freudenberg's suggestion of examining the rectum before applying the current. Horwitz and Czerny admit that accidents occur. Any one who has had much experience with the Bottini operation seems willing to admit that accidents are liable to occur, and at times are absolutely unavoidable.

So far as a study of statistics is concerned, he had used those he found in the literature. He had written to all the general and genito-urinary surgeons in the city requesting them to furnish him with their own statistics, but somehow many of them did not make any reply. Two, including the last speaker, declined to give their statistics, lest by so doing they should detract from the value of their own contemplated productions.

As to claiming any originality for the method he had outlined, the method had occurred to him at the time just as it undoubtedly had occurred to others. He did not claim it was his operation. He felt there were good reasons why the trans-

vesical route should be used in that large class of patients who could take a general anæsthetic. The entire operation should not exceed twenty minutes, and this certainly was as quick as the average Bottini operation could be done. It could be done with greater safety and with a greater degree of intelligence and accuracy.

He believed that this open method of cauterization with the parts under direct ocular observation had as many distinct advantages over the blind urethral method as the modern open herniotomy has over the old blind procedure.

EDITORIAL ARTICLE.

THE PREDISPOSING AND EXCITING CAUSES OF SUDDEN ATTACKS OF APPENDICITIS.¹

THE Germans have a very beautiful method of celebrating notable events in the lives of their great professional men. When in 1892 Billroth celebrated the twenty-fifth year of his professoriat, a volume of essays, specially written for the occasion, was dedicated to him by his former pupils and friends. At present, that kindly veteran Franz König has attained his seventieth year, and the publishers of the *Archiv für klinische Chirurgie* have brought out a special volume of their journal (over 1100 pages) dedicated to König and composed of essays by his former pupils.

The first paper in this valuable volume is by Riedel, of Jena, his subject being "The Predisposing and Exciting Causes of Sudden Attacks of Appendicitis."

A few months ago the writer had occasion to review for the ANNALS OF SURGERY a book on this subject by an extremely conservative German, and has thought that it might be instructive to consider the views of the leader of what may be called the more radical school.

Riedel's essay is entirely original, in so far that there is no attempt made to review the vast literature on appendicitis. Every statement of fact or opinion is based on or deduced from his own experience. Numerous case reports are furnished, and the principal histological conditions are beautifully illustrated. The essay is a model production.

¹ Vorbedingungen und letzte Ursachen des plötzlichen Anfalles von Wurmfortsatz-entzündung. Von Professor Dr. Riedel (in Jena), *Archiv für klinische Chirurgie*, lxx, S. 1.

The author sets out by promulgating certain theses, and, as these form the ground-work of his *arbeit*, they will be quoted almost *in extenso*.

(1) A healthy appendix, free from foreign bodies, practically never becomes by itself the seat of that disease known as appendicitis.

(2) An otherwise healthy appendix may take part in a cæcal catarrh, but this in no way alters the microscopic structure of the organ. Whether a disease analogous to appendicitis may originate in this manner or not is unsettled, but apparently it may not.

(3) Appendicitis is almost always an insidious disease which develops with scarcely a symptom. Like cholecystitis, it is usually discovered when an acute inflammatory process attacks the organ already suffering from chronic disease.

(4) A sharp or angular foreign body may enter and perforate a healthy appendix and rapidly produce a disease which remotely resembles suppurative appendicitis. Rounded foreign bodies (*e.g.*, enteroliths) can also, in time, perforate the organ directly; but, as a rule, they may by their presence slowly prepare the way for an acute inflammatory attack, and this latter produces the perforation.

(5) There are two predisposing causes for a sudden attack of appendicitis:

(a) An enterolith forms in a healthy appendix and occasions more or less circumscribed secondary disease;

(b) The appendix becomes the seat of an entirely characteristic primary disease.

(6) This characteristic primary disease is appendicitis granulosa.

(7) Enteroliths usually form in healthy appendices, but, exceptionally, they may arise in those affected by appendicitis granulosa or tuberculosa.

(8) Strictures or stenoses of the appendix may be formed, —sometimes as a result of the presence of enteroliths which are

later evacuated into the cæcum, or sometimes as a result of appendicitis granulosa (rarer).

(9) An acute attack of non-suppurative appendicitis is only occasionally traceable to an enterolith present in an almost healthy appendix. The predisposing cause for such an attack is usually appendicitis granulosa, or stricture or stenosis.

(10) An acute attack of suppurative or gangrenous appendicitis is more common in an appendix prepared for it by the presence of an enterolith than in one the seat of appendicitis granulosa, or of stricture or stenosis.

(11) In the former, as a rule, the character of the attack is more severe, progressive, and leads more quickly to gangrene. Acute gangrene of the appendix may occur on the basis of appendicitis granulosa and of stricture and stenosis.

(12) As a rule, the acute attack in cases of stricture and stenosis tends to run a mild course. Gangrene is less common in cases of stricture than in those of appendicitis granulosa. When stenosis is present, gangrene is scarcely possible.

(13) In appendicitis granulosa the acute attack is apparently often precipitated by hæmorrhage into the granulation tissue. The effused blood presses the tissues apart, elevates and injures the epithelium, and bacteria gain access to the small lymphatics of the chronically inflamed organ. The attack is very much like erysipelas of the skin.

(14) Marked general symptoms follow the lymphatic infection. When the lymphatics of an abdominal organ which is the seat of chronic disease become infected, local peritoneal irritation often occasions vomiting.

(15) As erysipelas is sometimes mild, sometimes severe, so acute lymphangitis, in the chronically inflamed appendix, is sometimes mild, sometimes severe. Mild lymphangitis gives rise to non-suppurative, severe to suppurative inflammation of the appendix, and the latter often leads to gangrene because the enterolith which prepared the soil is putrid.

(16) An acute attack in an appendix predisposed to it by any of the above-mentioned means (erosion by enterolith, appendicitis granulosa, stricture, stenosis) may lead to abscess formation without perforation of the appendix. To such abscesses alone belongs the name peri-appendicular.

(17) Occasionally, though rarely, non-suppurative appendicitis gives rise to peri-appendicular abscess remote from the appendix itself.

(18) Abscesses, especially those due to appendicitis granulosa, are comparatively frequently resorbed because they are hardly, if at all, putrid.

(19) Appendicitis granulosa has a distinct tendency towards spontaneous recovery through obliteration of the appendix. This obliteration may ensue slowly and insidiously or rapidly after an acute attack.

(20) Strictures and stenoses rarely recover spontaneously, especially rarely if they have been caused by enteroliths.

(21) The worst enemy of the patient is the eroding enterolith; it impresses on any attack the imprint of malignancy. The acute attack in cases of appendicitis granulosa is comparatively harmless. The putridity of an enterolith leads to the formation of putrid pus.

(22) The old and frequently neglected idea that enteroliths are principally to blame for bad terminations to appendicular inflammation must be held correct. Scarcely one-third of such cases runs a mild course; all the rest are severe. Exceptionally a cure results from the escape of the stone into the cæcum; generally, however, on its departure it leaves behind a stricture or stenoses of the appendix.

It will be seen that Riedel considers that acute appendicitis is due to two causes: viz., the presence of eroding enteroliths and of chronic or granulating appendicitis.

The eroding action of enteroliths can and does injure the epithelium to such an extent that acute infection becomes easy,

and the infective agent is almost always virulent under such circumstances. Riedel by no means claims that every enterolith present in an appendix produces such a result. In fact, he narrates cases in which enteroliths were found present in the appendix or in which they had recently escaped from the appendix, without any suppurative inflammation arising. The commonest result of the presence of an enterolith is the production of a stricture or of a stenosis.

By stricture is meant a narrowing of the appendicular lumen at a circumscribed spot; by stenosis, complete obliteration at a circumscribed spot. The organ is obliterated if its lumen is entirely lost, or lost for a long distance.

While appendicitis granulosa can produce stricture or stenosis, yet most of them result from the presence of enteroliths.

Acute appendicitis is very commonly the result of stricture or stenosis; but as, in Riedel's opinion, these conditions are almost always caused by enteroliths, they can hardly be considered the predisposing cause.

Space forbids us following the author's argument in regard to the importance of enteroliths in the appendix; suffice it to say that the case he makes is an exceedingly strong one.

One of the most interesting and instructive portions of the work under discussion is that referring to appendicitis granulosa and appendicitis granulosa hæmorrhagica. The author thus describes the characteristics of the disease: In the normal appendix the tubular glands lie close together, but in appendicitis granulosa a very vascular tissue composed of small cells pushes between them, circumscribes their bases, in a broad sheet, and, lastly, pushes between the closed follicles (solitary glands). The tubular glands are separated from each other to a distance equal to once or several times their diameter. The solitary glands are pushed forward towards the lumen of the canal and press aside the tubular glands which may be found bunched between them. Solitary glands and granulation tissue are always separated from

the lumen of the appendix by a single layer of short cylindrical epithelial cells. When the appendix is becoming obliterated, one often finds the epithelial lining entirely lost.

Hæmorrhage may occur in an appendix which is the seat of appendicitis granulosa, and may be the exciting cause of an acute attack. When such is the case, then the name appendicitis granulosa hæmorrhagica is proper.

Riedel's description of appendicitis granulosa and its sub-variety, hæmorrhagica, is most excellent. In looking over a considerable number of microscopical preparations of appendices with Dr. Frank Hall, the writer found many which corresponded absolutely to the type. Some years ago we published (*ANNALS OF SURGERY*, May, 1898) an account of three types of appendicitis obliterans which we had differentiated. On comparing these with Riedel's account of appendicitis granulosa it was found that two of our types corresponded to two different stages or forms of that disease, and hence must be so considered. Riedel does not believe that there is a variety of appendicitis worthy the distinction of the name appendicitis obliterans. From this opinion we must dissent, as we have described in the above article a variety in which the tubular glands and lumen gradually disappear as well as the lymph nodes or solitary glands, diffuse lymphoid tissue is abundant in the mucosa, the submucosa is thickened, and is composed of fully developed fibrous tissue containing no inflammatory exudate but numerous thick walled blood-vessels. The muscular tissues are much hypertrophied. In none of the specimens of this type could any granulation tissue be discovered. The condition is obliterative, but is not appendicitis granulosa. In Riedel's description of histological structure one finds little or no notice taken of the condition of the blood-vessels. In the examples examined by us, thickening of the intima and media was generally a marked feature. Such vascular change ought to exercise a distinct influence on the nutrition of the organ, lowering its resisting power.

Riedel disbelieves in the existence of catarrhal appendicitis,

never having seen or heard of a specimen in which, as the result of catarrh, anatomic changes could be demonstrated in the organ. Both on theoretic and practical grounds we believe that this is incorrect. Theoretically, we cannot but believe that when cæcal catarrh is present the mucosa takes part in the process. Usually the appendicular lumen is narrowest where it penetrates the cæcal wall, and here any swelling of the mucosa as effectually blocks the lumen as is the nose blocked by the swelling incident to a cold in the head. Unfortunately, in the appendicular catarrh there is no means of secondary drainage analogous to the pharyngeal drainage in nasal catarrh, and hence secretions are pent up in the appendix. Appendicular colic is the result of efforts made to expel the irritating and distending secretions. If the condition continues, one finds anatomic changes indicative of the trouble, to wit, hypertrophy of muscular coats of the appendix. Of course, here, to begin with, the appendicular trouble is secondary to the cæcal; but while the cæcal catarrh may be of little or no moment, the appendicular is of great importance, even of very great danger, and it alone calls for prompt attention.

Riedel makes little or no mention of muscular hypertrophy, a condition which we have found to be common. A continuation of the above state of affairs must surely lead to such changes in the epithelial lining of the organ that it becomes permeable to the ever-present infective agent. Patho-anatomic observations bear out the correctness of this belief in the existence of catarrhal appendicitis. We give the following description of two of our specimens:

(Specimen C 8.) Solitary follicles hypertrophied and pushed centralward so as almost to obliterate lumen. Between the follicles lie long tubular glands bunched together. The narrowed lumen is filled with mucous exudate and much ragged, desquamated epithelium. There is no infiltration of the submucosa. The blood-vessels are slightly thickened. The muscular coats are normal. There is no granulation tissue present.

Histological diagnosis: Catarrhal appendicitis.

(Specimen G 2.) Lumen of appendix narrowed and filled with cellular exudate (leucocytes). The epithelial lining mainly intact. Leucocytes are seen lying between the epithelial cells. Tubular glands practically normal, except that their epithelium is in the same state as in the lumen. Intertubular tissue full of leucocytes. Solitary follicles hypertrophied and pushed centralward. The lymphoid cells of follicles are swollen and their nuclei are vesiculated. The endothelial cells of the lymph spaces are large and proliferating. The lymph spaces are tensely filled with leucocytes. Diffuse hæmorrhages into the longitudinal muscular tunic and the serous tunic. There is no granulation tissue present.

Neither of the two cases cited shows the slightest evidence of appendicitis granulosa. The first case is evidently a sample of catarrhal inflammation; in the second the lymphatics and the lymph nodes are the main seat of the disease, which is evidently acute in character.

As will be seen, Riedel's article is incomplete, necessarily so, as it is based on the observations of one man, and such, no matter the extent of his experience, must be to some extent limited. In spite of these limitations, the work is one of the most important contributions to the literature of appendicitis that has appeared in years, and is calculated to make a profound impression on German surgical practice.

It is unnecessary to give any particular account of our author's views regarding symptoms, prognosis, and treatment, as, on the whole, they correspond closely to those of American surgeons.

Germany, strange to say, has only comparatively recently awakened to the importance of appendicitis as a surgical disease; the repeated alarms sounded in their Annual Congress by surgeons like Riedel are having, and are bound to have, telling results, and for such a contribution as that here reviewed he deserves the thanks not merely of his countrymen but of the world.

JOHN F. BINNIE.

REVIEWS OF BOOKS.

EXPERIMENTAL RESEARCH INTO THE SURGERY OF THE RESPIRATORY SYSTEM. An Essay awarded the Nicholas Senn Prize by the American Medical Association for 1898. By GEORGE CRILE, A.M., M.D., Ph.D. Second Edition. Philadelphia: J. B. Lippincott Co., 1900.

Dr. Crile's volume is a valuable piece of work and has cost him much patient labor. The work consists of 114 pages of large print and no padding. The style is clear, terse, and altogether praiseworthy. Some of the researches are more interesting than useful, others are both interesting and intensely practical. The study of the effects of prolonged manipulations of the brachial plexus will be of special interest to anæsthetists. Such manipulations produce increased respiratory action, and hence danger from over-narcosis. If the manipulations are kept up for a long time, respiratory failure is liable to follow their cessation, because the resources of the respiratory mechanism have been severely taxed by work under stimulation.

A careful study of the effect of blows on the lower chest and epigastrium ("solar plexus" blow of pugilistic lore) shows that the symptoms are due to direct heart trauma and not to any injury of the stomach, solar plexus, or diaphragm. The research into the production of symptoms by the presence of foreign bodies in the air passages is perhaps the most valuable of the series. The author finds that no amount of irritation to the mucosa of the trachea or even that part of the larynx opposite the cricoid cartilage produces marked sudden effects on the circulation or respiration, while irritation to the middle and upper

parts of the larynx causes pronounced reflex inhibitory phenomena, cough, and arrested respiration; more severe irritation arrests the circulation also. As preparatory treatment when operating for the extraction of foreign bodies from the larynx, one should administer atropine to protect the heart from reflex inhibitory impulses, so that if respiration should fail the circulation may go on, while artificial respiration permits the completion of the operation. Cocainization of the larynx is an excellent means of preventing inhibitory impulses being despatched from the larynx to the respiratory and circulatory systems. Dr. Crile is to be congratulated on the production of a useful and distinctly original book.

J. F. BINNIE.

AN EXPERIMENTAL AND CLINICAL RESEARCH INTO CERTAIN PROBLEMS RELATING TO SURGICAL OPERATIONS. By GEORGE CRILE. Cleveland: Alvarenga Prize Essay for 1901.

The remarks made in reviewing Dr. Crile's essay which won the Senn prize in 1898 apply to the present volume. It is original and valuable.

Experiments dealing with the physiological action of saline injections are of special value. The author finds that in suitable cases saline infusion will raise the blood-pressure to the normal point, but no higher. When the normal blood-pressure is once reached, as much fluid is thrown out by the emunctories as is artificially injected; this is due to diminution of the force and frequency of the heart beats and lessening the vaso-constriction in the area of peripheral resistance. It will readily be seen that when, owing to too great shock, vaso-motor resistance is lost, then, no matter how much saline solution may be injected, the benefit is *nil*.

Dr. Crile's volume contains interesting chapters on injuries to the vagus and on the physiologic action of cocaine and eucaine when injected into tissues.

J. F. BINNIE.

TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION. Volume xix. Edited by RICHARD H. HARTE, M.D., Recorder of the Association, 1901.

This volume contains the papers and discussions presented at the meeting of this Association held at Baltimore in 1901, Roswell Park being president. The number of papers presented is thirty-six, all representing a high class of surgical literature. The editorial work done by Dr. Harte does credit to the judgment of the Association in the selection of its recorder. The whole volume, well printed, illustrated, and bound, serves as an admirable index to the progress of American surgery and book-making.

The president's address is devoted to the investigations regarding the nature of cancer now being carried on at Buffalo. Dr. Park, while taking a judicious attitude, still holds to the tenability of the parasitic origin of the disease.

Dr. Coley presents a paper on the treatment of inoperable sarcoma with the mixed toxins. The results of this treatment during the last three years have given him no reason to change his views as expressed in earlier papers. While the results are far better in spindle-celled sarcoma than in any other form, there have been a sufficient number of round-celled sarcomas treated to make it seem advisable to give every patient with an inoperable sarcoma the benefit of a trial. The toxins, he says, may be given for a long time without harm to the patient. The percentage of cures, in his hands, has depended largely upon the type of cell, varying from 3 or 4 per cent. in the round-celled type to 50 per cent. in the spindle-celled variety. He has had absolutely no success in the treatment of melanotic sarcoma.

Dr. Joseph D. Bryant has a paper on the influence of mental states on the development of malignant disease. The paper by Dr. J. C. Da Costa, Jr., on the clinical value of blood examinations in appendicitis, is one of much importance. It involves a study of 118 cases. The author finds that the average case of appendicitis before operation shows a loss of about 30 per cent.

of hæmoglobin, and of more than half a million erythrocytes per cubic millimetre. Leucocytosis may occur both in the absence and in the presence of an abscess. It accompanies about 35 per cent. of non-purulent and 90 per cent. of purulent cases. He has also found that leucocyte counts ranging between 10,000, 15,000, or 17,000 cannot be depended upon to reflect the nature of the local lesion, since this degree of increase may be found both in mild catarrhal and in purulent cases. Counts of 20,000 or more invariably indicate the presence of pus, gangrene, or general peritonitis, one or all. He has furthermore found that leucocytosis may be absent both in trivial catarrhal and in fulminating cases as well as in forms of circumscribed abscess. Persistence of leucocytosis after the third or fourth day after operation may usually be attributed either to undrained pus pockets, to general peritonitis, or to both of these factors.

Drs. J. C. Da Costa and F. J. Kalteyer contribute a valuable paper on the blood changes induced by the administration of ether as an anæsthetic. Their conclusions point to the dangers of a general anæsthetic in cases with a low hæmoglobin percentage.

Another paper in this same category is on studies of the blood in its relation to surgical diagnosis, Dr. J. B. Blake being one of the compilers. Dr. John B. Deaver takes a practical view of the value of these blood examinations, and suggests that we will be doing much better surgery if we stick to the ordinary surgical signs and promptly operate on our appendicitis cases without wasting time over blood examinations.

Dr. Bloodgood, of Baltimore, gives a valuable paper on blood examinations as an aid to surgical diagnosis, in which he takes up the various surgical diseases and treats of their special blood conditions.

Dr. Robson, of Leeds, read a paper on pancreatitis which serves to bring into more prominent notice the importance of

this disease as a surgical lesion. The same author read a paper on the surgical treatment of chronic ulcer of the stomach.

Dr. Vanderveer, of Albany, has a paper on phlebitis following abdominal operations. Traumatic arteriovenous aneurism of the subclavian vessels is fully discussed by Dr. Matas, of New Orleans. He gives an analytical study of fifteen reported cases.

Dr. Mayo's operation for the radical cure of umbilical hernia is already familiar to the readers of this magazine.

During the period from 1891 to 1901 Dr. Coley has operated upon 845 cases of inguinal and femoral hernia. Five hundred cases of inguinal hernia, operated upon by the Bassini method, were traced from one to nine years, with six relapses. In a paper dealing with this subject, the author analyses these cases and reports individually the recurrences, giving the cause of the defect in each case.

Dr. Keen gives his experience in a resection of the chest wall for sarcoma aided by the apparatus of Fell for artificial respiration, and Dr. Matas describes a new method for artificial respiration by direct laryngeal intubation with a modified O'Dwyer tube and a new air-pump.

This volume also contains papers by Cullen on the early signs of carcinoma of the uterus, by Halsted on carcinoma of the breast, by Allis on fractures of the pelvis, by Moore on postoperative hernia, by Weeks on fractures and dislocations of the spine, by Freeman on the treatment of aortic aneurisms by means of silver wire and electricity, by Powers on sacrococcygeal tumors, and a number of other papers of equal importance.

The Transactions of the American Surgical Association are a repository of much of the best surgical literature of our time. These volumes constitute a symposium of surgical thought of great value to every student of surgery, all indexed and systematized.

JAMES P. WARBASSE.

INTRODUCTION TO THE DIFFERENTIAL DIAGNOSIS OF THE SEPARATE FORMS OF GALL-STONE DISEASE. By PROFESSOR HANS KEHR, Halberstadt. Translated by WILLIAM WOTKYNs SEYMOUR, A.B., M.D. Philadelphia: P. Blakiston's Son & Co., 1901.

There is probably no surgeon who has performed so many operations for gall-stones as Hans Kehr, of Halberstadt. Although this book, according to its title, is devoted to diagnosis, still, as a matter of fact, it deals with the general subject of the diseases of the gall tract; and just what the author means by "gall-stone disease" is not clear. The first chapter on the pathology and pathological anatomy of cholelithiasis deals in a general way with cholecystitis. Among the subjects also included in this chapter are hydrops of the gall-bladder, pericholecystitis, peripyloritis, condition of the liver in cholecystitis, Riedel's lobe, the different forms of jaundice, thrombophlebitis and cholangitis, sepsis, pyæmia, carcinoma of the gall-bladder, etc. Thus in this single chapter we find a pretty general view into diseases of the gall tracts. Just why the author should name his book after the diagnosis of one of the many symptoms or complications of these diseases, it is difficult to determine.

Other chapters are on the amnesis and examination in cholelithiasis; the special diagnosis in cholelithiasis; and the treatment of cholelithiasis. Part II, which comprises more than half of the book, is made up of 100 clinical and operation histories, "the exact study of which actually makes easier the learning of the special diagnosis of cholelithiasis for the practising physician." The author has in all operated upon 547 gall-stone cases.

He advises against operating for acute obstruction of the common duct by stone. He further says that one ought not in well-established lithogenous obstruction of the common duct delay operation longer than three months.

He exposes the gall-bladder by a longitudinal incision in the right rectus muscle. In doing cystectomy, he shows how impor-

tant it is to avoid angulating or strangulating the common duct. To avoid this he clamps the cystic duct well up towards the bladder. Then he divides across the duct till its lumen is exposed. The artery should be ligated separately. He then overcasts the stump of the cystic duct and, having removed the gall-bladder, tampons down to the suture, bringing the gauze out at the upper angle of the wound. *Fistulæ* in the *choledochus* close quickly and spontaneously, he finds, if the duct is patent. The majority of pains which are called cramps of the stomach are gall-stone colics, the author says; and, further, he observes that the slight dangers of early operation stand in no sort of relation with the great dangers of the disease itself.

This book contains a large amount of information on the subject of inflammatory diseases of the gall tract, and is a valuable contribution to the surgery of these diseases.

The translator has followed the German style with great faithfulness; indeed, some of his constructions really detract from the seriousness of the subject under discussion. The opening words of the book are, "already very often."

The following expression reads as though translated from Ambroise Paré: "But the woman would of further operations have none, for which one cannot blame her." Here is a fine example of Teutonized English. "Liver, of normal appearance, is somewhat movable, yet is the far to the right, high up under the liver lying contracted gall-bladder only with difficulty brought to view." There are worse things that can be said of translations than that they show the hall-mark of the original cast. This work is a faithful translation, and deserves the attention of every surgeon interested in the surgery of the bile tract. It is not a treatise on the subject, but it is a description of the experience of a single man of large experience. It shows the signs of rare individuality, and we congratulate the author and the translator.

JAMES P. WARBASSE.

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